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# *PLANNING*

THE ARCHITECT'S HANDBOOK

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## THE ARCHITECT'S HANDBOOK


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# *FOREWORD*

THIS EXCELLENT BOOK first appeared in 1936 and now, 23 years later, the eighth edition is offered to architects and to the public.

'Planning' provides a mass of information about buildings of many types and, as its name suggests, is particularly valuable to those who are designing new buildings. In a few moments one can become familiar with problems of layout, plan analysis and circulation and information is given on such details as are likely to affect a general plan the ultimate solution of which must, as the Authors point out, rest with individual designers.

The new edition has been completely revised and a number of sections or subsections has been added. Many of the diagrams have been redrawn and the page format, particularly in relation to the diagrams, figures and tables has been redesigned. In addition special sections of information common to all types of building are now included.

As planning problems increase in complexity and as modern building construction requires ever greater knowledge on the part of the designer, so it is that books such as this help to relieve the increasing burden on the architect by enabling him to gain much varied information in a very short time.

The Authors have done an immense amount of work in the compilation of 'Planning' in its latest form and they have undoubtedly earned the gratitude of the architectural profession.

1959

*Kenneth M. B. Cross*
*M.A. (Cantab.), P.P.R.I.B.A.*

# INTRODUCTION

PLANNING is a factor of total architectural design.

It is not and cannot be an 'end-all' or panacea for all architectural problems or difficulties.

Architecture involves ultimately three-dimensional study in addition to that of the two-dimensional plan. It includes the relationship of sections and elevations; it must take care of proportion and the composition of parts; its exponents must consider texture, colour, quality, refinement and must feel and express humanistic purpose. None of these things can be ignored or forgotten and the basic plan least of all in total architectural design.

In fact it has been said, with truth, that a bad plan can never produce good building and, with equal truth, a good plan may lead at least halfway to architecture.

Practical planning must start from a broad statement of programme. Sometimes this is, by general knowledge or tradition, a statement of the obvious, for example, the requirements of a dwelling. Even here, however, additional knowledge (not necessarily common or general) must enter into even the broad essentials of a plan; consider the variations in requirements in a country house, a town house, in multi-storeyed houses, bungalows, flats or maisonettes and it will be seen that many factors must be considered in order to arrive at the broad terms of a problem or of its statement as a clear and defined programme.

Any such additions to understanding must in turn come from a classification of the factors or requirements governing each type of building; these are either within the knowledge and experience of the designer or are outside it. If the latter is the case, then organized and logical analysis of a given problem will result in a classification of unknowns as against knowns and should enable a programme, or list of requirements, to be laid down. It has been soundly said that unless questions are well framed answers will be ill found.

The unknowns must be subjected to examination through a process of analysis, or research into parallel cases, generally of the past, by requirements laid down by the user or client, or by the classified accumulation of experience stored for future use. So it is that a planner of buildings proceeds to formulate an answer to a given problem.

Unknowns will vary in content with each individual planner. Specialists in one type of building have the least reserves to bring to bear on another type of building or problem. An architect, however, is one who, generally, is trained up in a broad knowledge of many types of building and though in detail his knowledge may be inadequate to cope fully with all types, his training enables him (or should do so) to perform the necessary analysis and classification in preparation for the planning of a type that is new to him and, by routine study, the unknowns can be reduced to a working level from which a new problem can be solved.

Procedure built up on the lines indicated above can provide a yardstick against which all the detailed development of a particular plan can be measured. The items of the resulting programme provide for the designer a sort of ' check list ' or reference against which the work of building up a complete plan may be reviewed from time to time.

This book, now presented in a completely revised and rearranged edition, is designed as a tool to assist planners of buildings in assembling elements or considering factors affecting a number of widely differing types of building. In the presentation of such basic requirements and principles and the common details of components and equipment which affect planning layout, it cannot be too strongly emphasized that the book is not concerned with either two- or three-dimensional criteria for aesthetic or architectural solutions of a problem. Nor can it seek to suggest methods of expression, whether by means of finish or materials, proportion or texture; these are all those other things or factors which must be added to planning to achieve architecture in the fullest sense and, inevitably, these remain matters for the individual designer to add, in his capacity as the ' complete architect '.

Much of this book cannot fail to be of use to students, whether in a ' recognized ' school of architecture or engaged in outside studies. For them also the points already outlined above are even more important than for the mature designer; with the additional warning that no text-book can be self-sufficient or exclude wider fields of research and study.

Again, as suggested in previous editions, the authors believe that the book will also be found useful by those who have to commission new buildings, alter old ones, or manage and maintain buildings in use.

Since the last war and, partly, even because of it, the planner of buildings is finding that the ' grid ', as a basis for planning layout, is becoming more important. Not only is this the case for so-called prefabricated buildings, but its usefulness is being stressed (not always in wise ways) for many other types and fields of building technique. It would not seem inappropriate, therefore, briefly to consider here some aspects and impacts of planning grids.

The use of a grid is by no means a modern development; in the past, even the distant past, it has often been used for the layout of individual buildings.

The newer developments lean towards the use of a standard grid or series of grids for all or many types of buildings. Any danger for the future would seem to lie in the misuse of the system by the adoption of a large number of unrelated grids uncoordinated by either designers or the manufacturers of components.

The essential difference between the planning grid, an instrument of the drawing board in the design of a building, and the extension of the use of such a grid into the actual execution of a building on a site, cannot be too strongly stressed. The former exists as a tool for the designer, into which he must fit all those parts required for the completion of a building. At present this can be accomplished or not as it is found that the extent of the market provided by manufacturers covers the components required. It follows that, as the position now is, many different grids adopted by various designers will produce as many differing types and sizes as manufacturers are willing to produce and stock; in the future such a course might well lead to extensive uneconomic production.

To extend fully the grid theory into the field of practical building means one of two things; either the designer will be limited by the few alternatives economically provided by manufacturers and will, in consequence, often wish to revert to 'free' design untrammelled by grids; or, given a reasonable agreement between the design and executive sides of building, the architect will acquire a 'grid-tool' common to both sides of his work.

To be of full use in all fields, it will be necessary that components, made by different manufacturers, should fit the spaces allocated to them in the varying designs without modification. To do this the dimensions of the components must be related by a single unit of measure—the module. Similarly the sizes of planning grids should also be multiples of the module. This would permit the use of various sizes of grids whilst, at the same time, ensuring that component sizes and grid sizes will be related to one another in the simplest possible way.

In this way, it is suggested, the designer will find his freedom of choice in design sustained, the manufacturer will not be overloaded with too many sizes for production and stock, and both national and international economy will find assistance.

It is in this sphere of thought and method that present-day investigations, conducted, both in this country and abroad, into a basis for 'modular co-ordination' applied to building are taking on an increased intensity. When ultimate agreement is reached, it is evident that long-term adjustments will occur, and that these will affect the designer in many ways. Not the least of the impacts will be on standardization of prefabricated materials and components for buildings.

Up to the present time dimensional standards have been established by

traditional or manufacturing usages and this has led to many differences in the basic relationships of standards. Modular co-ordination will bring existing inconsistencies in the relationships of planning grids and the standardization of components into line and will certainly greatly ease the designers' problems, both in planning and supervision.

This brief survey of what is very much a present-day problem will indicate that, whatever the outcome, the effect on the planning of buildings and even on architectural expression will be considerable. It does not, however, necessarily materially affect the basic surveys of function and detail which form the bulk of this book. For it is self-evident, whatever is the fate of the grid, buildings will be designed by human beings for the use of human beings and to this fundamental point must be related all planning and the execution of all plans in the field of building.

It will be noted that this edition follows a new layout; first there is a series of sections analysing those elements which are common to several types of building and, secondly, a number of sections which deal with particular types of building and the factors peculiar to each.

While this may involve the reader in a certain amount of cross-reference, there are many advantages in the new arrangement; not the least of these is that the bulk of the book is reduced, not by the exclusion of information, but by its non-repetition within the special sections, as was the case in previous editions.

The authors again wish to acknowledge all the sources and the assistance they have received in the preparation of this new edition; from books, periodicals, people and associations. To set all these out in full would be the authors' desire, but space is too limited; instead they ask that their sincere thanks here expressed may be accepted by all concerned.

# PART ONE

Information applicable to more than one type of building

# Sites

## A CHECK LIST

The ultimate planning of any building or group of buildings is influenced by site conditions and by the surroundings of the site. The physical and other factors inherent in any given site must be therefore among the first considerations to which an architect pays full attention.

Unfortunately, the architect, called upon to design a building or scheme, is not often consulted in the choice of site. He is more frequently presented with a *fait accompli* and is then charged with planning his scheme in the best possible way to fit the conditions imposed by the site. Obviously if the architect can be consulted when sites are being selected, his advice may be advantageous to a promoter in the total formulation of a successful scheme.

In this section the various factors are reviewed which may influence the choice of sites or, if the site is already chosen, the various considerations which may be imposed upon the designer in the planning or layout of the buildings.

Most sites have a number of factors either in common or found in varying combinations. Firstly, these are set out in the form of a check list for handy reference by the planner and, secondly, the more usual and general requirements and conditions of sites are reviewed in greater detail.

FACTORS AFFECTING CHOICE OF SITE AND LAYOUT OF BUILDINGS

| *FACTOR OR CONDITION* | *EFFECT ON PLANNING* |
|---|---|
| Soils (superficial) e.g., gravel, clay, amount of top humus, etc | Surface drainage; type of planting and garden details; finish and base for light roads and paths. |
| Subsoils. | Foundations; retaining walls; carrying capacity of subsoils; type of excavation required. |
| Lower strata, e.g. type of rock, mining, underground railways, etc | Foundations; retaining walls; basement structures; carrying capacity; type of excavation required. |
| Levels, relation of contours to sun, etc. | Contours affect placing of buildings and entrances thereto; relationships to adjoining sites and roads; surface drainage and sewage disposal. |
| Prevailing wind. | Placing of buildings; shape of buildings; planting and layout generally. |
| Made ground, e.g., fillings of previous basements, mineral workings, etc. | Placing and shape of buildings; foundations; type of excavation required. |
| Ditches. | Surface-water drainage and its replacement if ditches are filled in; foundations, etc. |
| Wells (existing) (including R.W. Sumps, etc.). | Re-use affects layout and buildings; drainage; filling in affects foundations, etc. |
| Water-table. | Foundations; excavations; basement tanking, etc |
| Trees, preservation. | Well-matured trees (scheduled or otherwise) affect planning of buildings; site layout; roads, etc. |
| Rights-of-light (particularly in urban areas). | May curtail heights of buildings; distance of buildings from boundaries. |
| Rights-of-way. | May have to be retained, purchased or closed by Local Authority or Central Government action; closure may involve compensation or alternative routing. |
| Way-leaves (e.g., P.O. telegraphs, etc., electric power lines and the like) | May have to be retained or removal negotiated with the undertakings of the authorities concerned. |
| Party-walls. | May have to be used or shared with adjoining owners, alternatively new work built alongside with some loss of site-space. May be the subject of Awards (under the London Building Act) or agreements with adjoining owners in other locations. Foundations may be affected; underpinning may be required. |
| Boundaries of site | Entrances; relationships to public highways and to adjoining sites. |
| Building lines, usually laid down by Local Authorities. | Layout of buildings; may involve setting back of building frontages. |
| Services (Public or Utility), available in adjoining roads or through adjoining sites. | Water, gas, electricity, hydraulic-water mains, water supply, generally subject to local or national regulations; may affect layout of buildings or site. Amounts of supplies available may affect planning. Sewers (soil or surface-water or combined) affect general layout of scheme; capacity may be material. Levels of sewers affect basement or other low-level planning, may involve drainage weirs or alternatively pumping or lifting apparatus. |
| Public Transport, Roads. | Availability may affect suitability of site for communal purposes; main roads carrying much traffic may be disadvantageous for some developments. |
| Zoning (Town and Country Planning Acts). | Affects use or limits use of both site and buildings. |
| Amenity, etc. (Town and Country Planning Acts). | May limit heights of buildings, site coverage and/or plot ratios, facing and/or roofing materials; may affect form of buildings, e.g., flat or pitched roofs, etc. |
| Road widenings, under Town-planning schemes, and/or Ribbon Development Act, etc. | May be subject to requirements of Local Authority and/or Ministry of Transport, affects entrances to site, setting-back of buildings, etc. |
| Service Roads, (ditto) | Usually required on trunk or class A roads and may be elsewhere; affect entry to site and/or number of entries and their positions |
| Railways and Canals. | Availability, possibility of sidings, etc., may affect choice of site; position affects layout of site and buildings. |
| Local Authority By-Laws. | Various, may affect detail planning of buildings |
| Local Government Acts (e.g., London Building Act, etc.). | Various; may affect detail planning of buildings, sites, roads, etc. Fireproofing, escape, etc. |
| Public Control, Local Authorities Police and Fire Officers requirements). | Various; may affect entrances and exits to and from sites; use of sites for certain purposes (i.e., Cinemas, Theatres, Garages, etc.) |
| Public Health Acts. | May restrict use of certain sites and/or affect planning of buildings |
| Factory Acts | Ditto |
| Petroleum Act and subsequent Statutory Rules and Orders. | Various; may affect particular types of layout and buildings, e.g., factories, garages, petrol stations, etc. |

NOTE.—Urban and rural locations will impose differing limitations and conditions; this list is intended to cover both.

### General

Circulation within the boundaries of a site must provide for the movement of (a) vehicles, (b) pedestrians and (c) the mechanical handling of goods; in addition, the safety and convenience of all must be looked after at all points of intersection within the site and of exit from and ingress to the site.

Vehicles must have a clear view of the highway when emerging from the site. For example, some setting back of entrances to a building or through the boundary walls of a site provides better sight-lines for drivers. It is good principle to ensure that the outgoing driver has a full view of the highway in both directions before he has to cross the public footway. Figs. 1 and 2 illustrate some of these points under urban conditions. Where heavy traffic occurs on larger sites, separate " In " and " Out " ways should be provided.

Pedestrians, particularly under crowded conditions of exit or entry to sites, as, for example, in schools or factories, should be similarly guarded and assisted. Guard-rails along the kerbs of the public highway for some distance on either side of the entrance or exit are sometimes provided. But this method is not entirely satisfactory: some such method as is shown in Fig. 3 is much to be preferred.

Vehicular and pedestrian circulations within the site call for roads, and footways; the latter may not be required if traffic is slight and people can use the roadways without undue danger.

Roadways should not be taken up to the walls of buildings, but should be provided with side paving or kerbs to prevent damage to the walls. Where vehicles are liable to face or back into walls, kerbs or paving should be made considerably wider than normally used along the lateral run of a road; 3ft. for cars, and at least 6ft. for larger vehicles. Spurstones should be used to guard the corners of buildings or openings where sidewalks are dispensed with.

Paved footways may be taken up to the walls of buildings, but other features of the layout, such as flower beds or lawns should be kept at least 12in. away to prevent mud-splashing from rain or hoses and to facilitate maintenance work. Such a space should be paved in non-absorbent materials; it provides also for gullies, down-pipes, etc., to be free of planting.

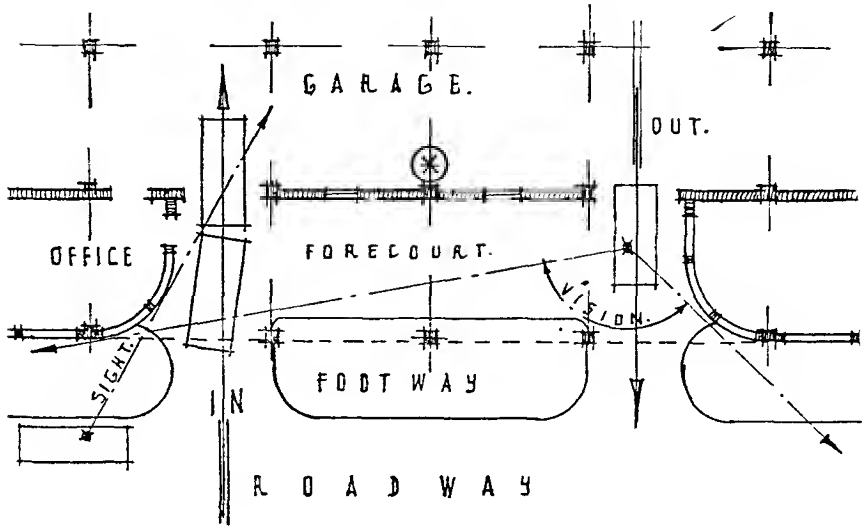



Fig. 1 Vehicular access. Example, entrance to a garage

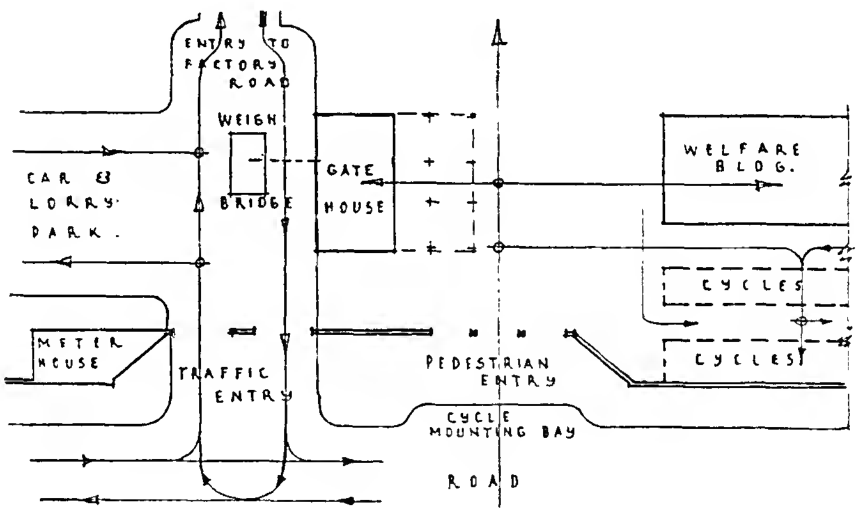



Fig. 2 Vehicular and pedestrian access. Example, entrance to a factory

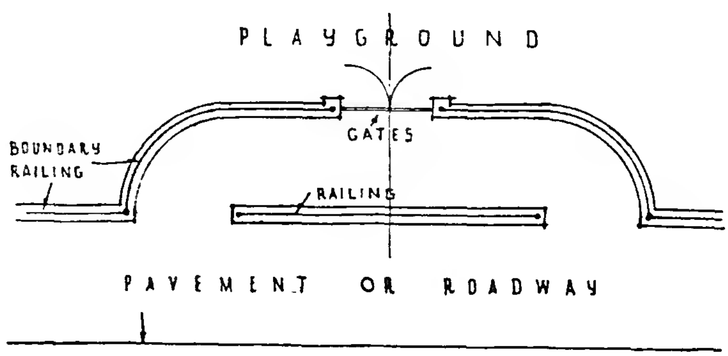



Fig. 3 Pedestrian access. Example, entrance to a school

## BOUNDARIES OF SITE

### General

" Open " sites, where the buildings do not impinge on the boundaries, may be closed by fences, railings, hedges and/or ditches and ha-has, and access gates or ways will have to be provided (*see* Fig. 4).

Fences and railings of different materials, other than concrete, are better erected from the basis of a solid kerb as a protection from ground damp and its consequent damage. There are many types of " unclimbable " railings, the usual height of which is from 6ft. to 6ft. 6in.

Walls are often a combination of pier and panel, whether of brick, stone or precast concrete. Posts or piers should be on the inside of the wall, to keep the external pavement or road tidy: and, in addition, it can generally be assumed that projections will be less damaged from within the site.

Hedges, whether alone or in combination with ditches, take up considerably more space than fences or walls and full allowance should be made. The width to be allowed for a full-grown hedge depends, to some extent, on the species selected and the height to which it is desired that the growth shall be maintained.

Ditches will also be governed in width by local conditions and are generally widest in low-lying flat land. They are usually on the outside of boundary hedges, where they are often used to assist the drainage of footpaths or roads, the latter, in many instances, being public ways. Every effort should be made, in rural or other suitable sites to preserve old hedges and hedge-row trees so that local character may not be destroyed unduly by new development.

Gates of various materials, fixed to brick or stone piers or posts of metal, wood or concrete, should not be less than 8ft. 6in. clear width for vehicular traffic. Such gates can be combined in various ways as single or double gates, with side pedestrian ways and gates, or with stiles or turnstiles. Gates in many schemes, from country houses to factories or schools, are often combined with lodges, gate-offices or with weigh-bridges. Where access ways occur on estates or farms in open country, gates are sometimes omitted and roller or gridded passage ways laid down, to permit easy access for wheeled or pedestrian traffic but to stop cattle, etc., from straying.

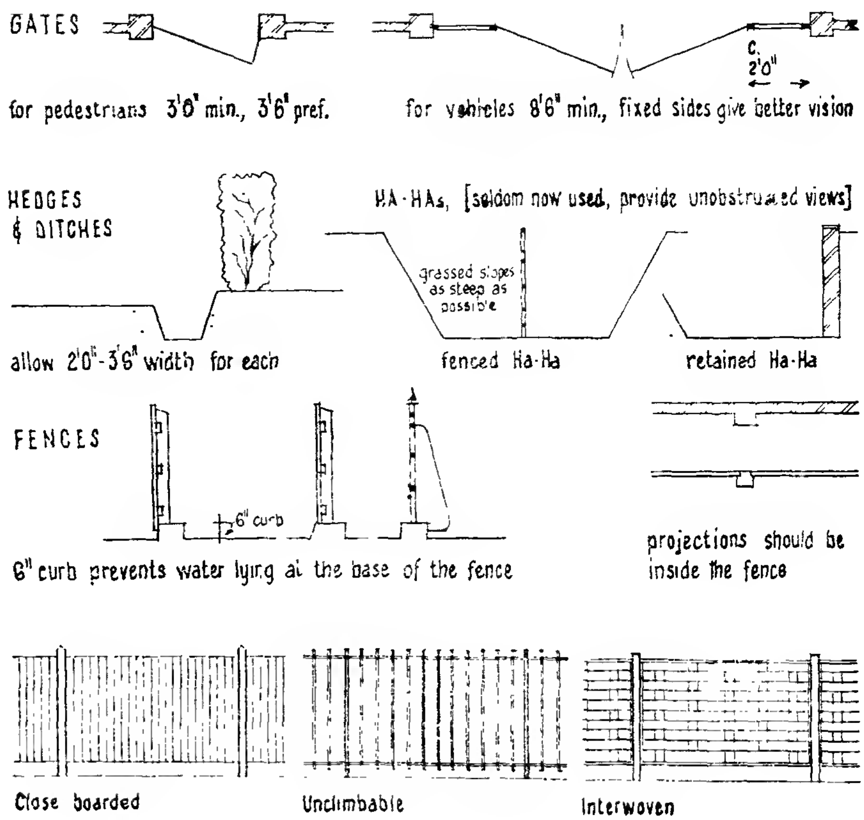



Fig. 4 Types of gates, hedges and ditches, and fences

TYPES AND SIZES OF FENCES FOR VARIOUS USES

| Types of fence | Maximum distance apart of uprights | Depth of posts in ground | | Heights of fences | Materials for posts | Heights of fences for various uses | |
|---|---|---|---|---|---|---|---|
| Chain link | 10' 0" | up to 4' 6"<br>over 4' 6" | 2' 0"<br>2' 6" | 3' 0" 3' 6" 4' 0"<br>4' 6" 5' 0" 6' 0" | Concrete<br>Steel<br>Wood | Housing | 3' 0" min. |
| Woven wire | 12' 0" | 2' 0" | | 2' 6" 2' 8" 3' 0"<br>3' 9" 4' 0" | Concrete<br>Steel<br>Wood | Estate boundaries | 4' 0" |
| Strained wire | 10' 0" | 2' 0" | | 3' 6" 4' 0" 4' 6" | Concrete<br>Steel<br>Wood | Playgrounds | 4' 0" min. |
| Cleft chestnut pale | 10' 0" | up to 4' 6"<br>over 4' 6" | 2' 0"<br>2' 6" | 3' 0" 3' 6" 4' 0"<br>4' 6" 5' 0" 6' 0" | Concrete<br>Wood | Public buildings | 6' 0" |
| Close boarded | 9' 0" | up to 4' 6"<br>over 4' 6" | 2' 0"<br>2' 6" | 3' 6" 4' 0" 4' 6"<br>5' 0" 5' 6" 6' 0" | Concrete<br>Wood | Highways | 4' 6"—5' 0" |
| Wooden palisade | 9' 0" | up to 4' 6"<br>over 4' 6" | 2' 0"<br>2' 6" | 3' 6" 4' 0" 4' 6"<br>5' 6" | Wood | Railways | 4' 6" |
| Post and rail | 9' 0" mortised<br>6' 0" nailed | 2' 6" | | 3' 9" 4' 3" | Wood | Commercial buildings | 6'0" |
| Continuous bar | 3' 0" | 1' 6"—2' 0" | | 3' 6" 4' 0" 4' 6" | Steel | Pigs<br>Sheep | 2' 8"—3' 0"<br>3' 9"—6' 0" |
| Unclimbable | 9' 0" | 4' 0"—4' 6"<br>5' 0"—6' 0"<br>7' 0" | 1' 9"<br>2' 0"<br>2' 6" | 4' 0" 4' 6" 5' 0"<br>5' 6" 6' 0" 7' 0" | Steel | Cattle<br>Horses | 3' 9"<br>4' 0" |
| Interwoven | 6' 4" | 2 0" | | 3' 0" 3' 6" 4' 0"<br>4' 6" 5' 0" 5' 6"<br>6' 0" | Concrete<br>Wood | Rabbits | 3' 6" |

### General

Built-up sites present various problems for the planner; many of these have been noted in the check list at the beginning of this section. Rectangular or other regularly shaped sites are comparatively easily laid out and are subject only to normal restrictions usual to such sites, party walls, angles of light, heights of buildings, etc.

The irregular site, however, with boundaries that are not straight and non-parallel with each other, asks for careful consideration and, often, the careful weighing-up of the advantages of adjustment of the external plan shapes of buildings against the loss of area which such adjustments may involve. Fig. 5 A and B is one illustration of this type of analysis. The gain in structural uniformity and straightforward internal layout by the shaping shown in diagram B together with a possible consequent gain of height in some parts of the building, where, in any circumstances, upper storeys have to be set back, is self-evident if comparison is made with diagram A, which shows that the irregular perimeter of the site has determined the plan profile of the building for its full height.

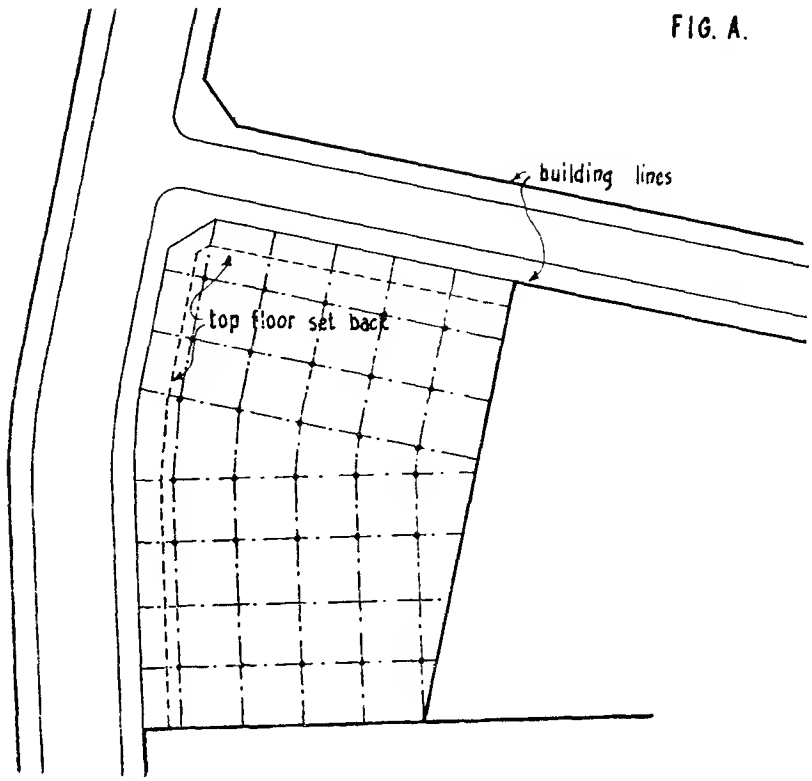
In addition, the improved grouping that adjustments of this type allow, may be of great value in the general street picture from the wider angle of town planning.

### Extensions to Buildings

Any foreseeable extensions to buildings should be planned, at least in outline, when sites are being laid out for any sort of development.

In closely built-up areas this may prove difficult or even impossible and under certain circumstances extensions may, in consequence, have to be planned vertically with the initial structure designed for the future loading. Such a method is, from the point of view of economy, not to be recommended except where no other possibilities exist.

On open sites, however, extension schemes can be visualized and due provision made for the future by the provision of space which is in the right place and duly related to the initial scheme, with all that implies for access, services and amenity.



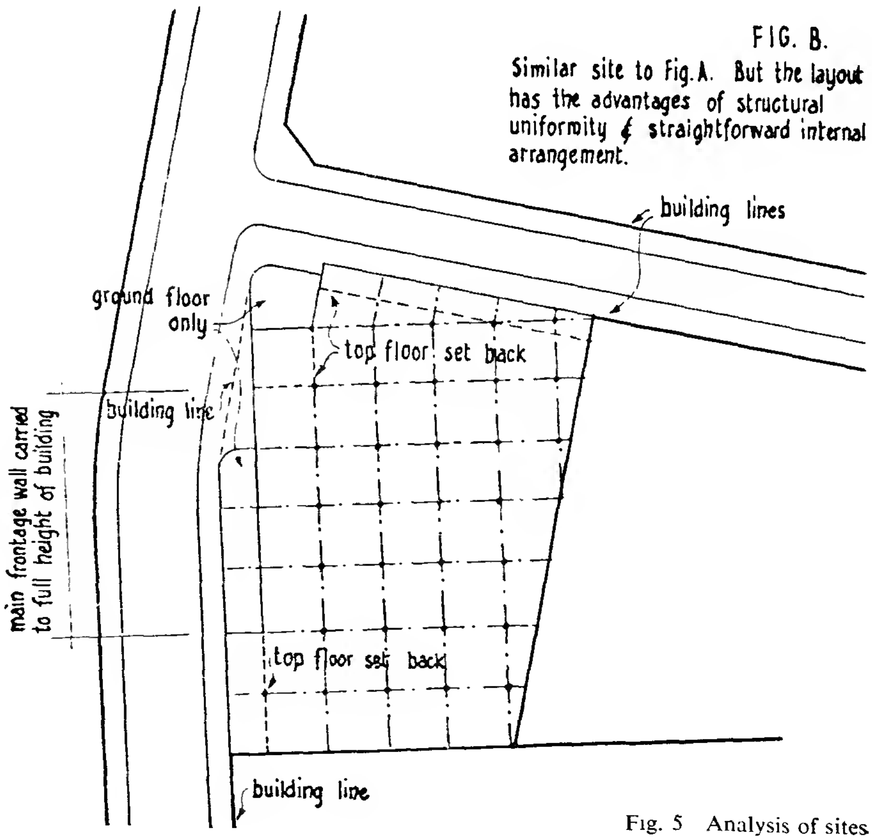




Fig. 5 Analysis of sites

## SERVICES

### General

In the majority of projects some or all services will be available from public supplies, but in some layouts, generally the larger types, access to services may be limited to a small number of points or even to one point for each service on the perimeter of the site. In such cases it may happen that these points are not coincidental and provision for the essential services must be made from connections that are on opposite sides of a site. Such conditions may affect the layout of buildings or may lead to a careful weighing-up of the cost of running services within the site against the planning of buildings from other points of view, such as aspect or contours.

Resultant compromises can only be made by equating all the factors of site planning, and obviously must depend largely on the conditions of each scheme.

### Water-Supply

Water must sometimes come from wells or borings and these, owing to subsoil conditions, may be at a distance from buildings; in any event, they must be kept away from sewage disposal. Water obtained from springs and stored is easier to deal with, as, more often than not, the initial supply will be found at a higher level than that of the buildings and the sewage-disposal arrangements will be at the lowest level of the site.

Under certain conditions, such as the development of flat land, locally obtained water, or even water brought from a distance, may have to be stored in high-level tanks or cisterns to obtain the necessary pressure for the buildings. Unless the building design lends itself to high blocks, at the top of which such storage can be planned conveniently, water-towers may have to be provided. Such constructions should be considered very carefully in relation to the building layout as a whole and must, in addition, be related to the external aspect of the site and its buildings. A whole group, though well-planned in itself, may be marred, when viewed from a distance, by the misplacing of a high water-tower or power-house smoke stack. It is not impossible to conceive that these two elements may be combined to assist grouping and may, in fact, provide practical advantages as a result.

In certain types of industrial development water is often required in considerable quantity for cooling purposes. Some processes also require a large supply for washing or dilution purposes.

In these projects it becomes almost essential that the site should adjoin a major supply of water such as a river, canal or lake. While it may be a relatively simple matter to arrange for adequate water sources of this kind, the disposal of exhaust condense-water from cooling towers and the like, where it cannot all or in part be re-used, is more difficult. The raising of temperature of rivers or other natural waters becomes a factor upon which conservancy boards, harbour authorities, etc., will have to be consulted: and they may impose limiting conditions on the type of discharge water, mainly concerned with temperature, filtering against sludge and bacterial growths, and may ask for precautions to be taken against the scouring of embankments or the silting of navigation channels.

Even greater precautions should be taken and may indeed be imposed on promoters with regard to water used for washing processes or dilution of effluents from many industrial sites. Again, sludge pits, filter beds or even chemical treatments before discharge constitute thc main type of solution, but the various cases must be dealt with individually and will be affected by the factors of situation, type of water into which discharge is required and other local conditions.

### Electricity

Supply is usually obtained from the public mains or the grid lines, the latter mainly in rural districts. When the latter are the source of initial supply it may be necessary to consider the provision of sub-stations. These may be required to be shared by a number of surrounding developments or, in the case of a large layout, may be built for its sole use. Easy access for the handling of transformers, etc., may be required and, more often than not, the necessary equipment must be located near the boundaries of the site and adjacent to a public highway. The length of run for high-tension cables within a site may be a factor contributing to a final decision on the layout. In rural districts, electricity is often brought to a site by overhead lines, branching from the grid routes. This may constitute a high-cost charge against the promoter. if the distance is great; but this can be reduced if the local line can be arranged so that it may be shared by a number of consumers. Way-leaves may have to be negotiated with owners of land over which the lines are brought to the site.

With such overhead methods the question of amenity arises and various consents must be obtained from the planning authority and even individual owners of land in the vicinity, as objections may be raised from an appearance point of view. Where it is possible to do so and the supply authority agrees, it may be better to bring the lines underground and the extra expense involved may eventually be justified by gains in maintenance costs and from the point of view of amenity (appearance).

Where electricity is generated by a plant forming part of the mechanical equipment of a scheme, it can affect general planning but little, though its position on the site, as that of the heating and hot-water plants, with which it may be associated, must be carefully planned in relation to both site and the buildings and to external access thereto.

### Refuse Collection and Disposal

While in smaller schemes this will be met by the usual procedure of periodic collection by the Local Authority service, there are many instances where, temporarily, local site arrangements must be made. For example, in flat schemes; chute methods and centralized containers for each block require that internal roads be provided, suitable for the circulation of the collection vehicles. Care should be taken that the widths of such roads, corner curves, backing-in and turning-out spaces are adequate for the type of vehicles likely to be used. The latter may vary considerably as among different authorities.

The disposal of industrial waste of all kinds may affect the planning of factories and similar schemes, in so far as access for road or railway vehicles is concerned and, to a lesser extent, access to the site from river and canal wharves. All such exit ways for waste

disposal must be planned at an early stage in a scheme, to avoid unsightly dumps and to avoid any interruption of delivery and dispatch routes or the internal circulations of goods and vehicular and pedestrian traffic.

### Fire-fighting Services

Arrangements for larger sites may be the subject of special provisions by the promoter in respect of anything from internal hydrants and dry mains to the housing of pumps and other mobile equipment. Such private organization, being highly variable, must be met by consideration of each individual case.

External fire-fighting services provided by the Local Authority, however, are governed by broad requirements which may be generalized as follows:

Easy access to all buildings from public highways for both firemen and their equipment. In the instance of large office buildings or similar block development, special provisions may be required in connection with one or more of the staircases and/or lifts. One or more of the latter may be required to be isolatable in both controls and power supply for use in emergencies.

Where sites are laid out with a number of separate blocks, as, for example, for flats, schools or hospitals, all buildings, of whatever height, should have a paved space or roadway at least 10ft. wide on at least one side of each block for equipment access. If the spaces around blocks are enclosed by walls or fences, 20ft. is the minimum width required adjacent to the buildings for the operation of wheeled escape-equipment.

The maximum width over which such an escape can operate from the outside of walls or fences is 15ft. If blocks are in separate occupancies on each side (i.e., two lettings deep) access will be required from both sides of the block.

Care should be taken to avoid obstructions to equipment circulation and handling, such as lamp-posts, trees, etc., near to buildings or at turning points on roads or in court-yards.

Internal roads or other surfaces in a large layout should be designed to withstand vehicle weights up to $6\frac{3}{4}$ tons for the combined pump-cum-escape unit and up to 17cwts. for the detachable wheeled-escape unit.

Where blocks of buildings exceed 42ft. in height (to the top floor), the London County Council lays down further requirements and although these apply only to that area, they form a good guide for practice elsewhere and may be summarized as follows:

The roads on one side of each block (or both sides of a "double-occupancy" block) should be reinforced to carry vehicular loading up to a total of 12 tons for each vehicle (the 100ft. turntable ladder being the largest and heaviest of the equipment) and be at least 12ft. in width. Such a roadway or paved strip should be sited so that the edge nearest the buildings is not less than 16ft. or more than 33ft. from the buildings; 20ft. is the most satisfactory distance for the operation of this type of equipment.

Access gates for external fire-fighting appliances should not be less than 8ft. 6in. in the clear and the turning-circle space allowance should be 50ft. to 60ft.

### Telephones

In larger urban schemes these are usually dealt with by means of underground services, both external to the site and within its boundaries.

In smaller schemes, particularly in rural or suburban localities, overhead services may cause considerable thought for the planner in avoiding unsightliness. The latter may arise from posts or the running of wires against buildings or skylines.

Wherever possible this service should be planned beforehand in consultation with the authorities and the lines designed to enter the site and to circulate within it in the most inconspicuous manner.

### Drainage

Drainage to public sewers is normally possible. The layout of drainage within the site is mainly controlled by the levels of the sewers and by whether the sewers are combined or separated into soil and surface-water.

Where, however, no public sewers are available, other means of disposal must be found, and these must conform to local by-laws and any other regulations which may apply. For example, disposal may be by means of septic tanks or, more rarely, by cess-pools or by means of a full disposal plant including filter beds and other equipment.

The levels of the site to be so treated need to be carefully considered from the outset, so that falls may be obtained in the right direction to outfalls: and such matters will, in turn, affect the position and often the whole layout of buildings on the site.

Local-disposal methods must also be related to the water-supply if the latter is to be from wells or borings. Outfalls from septic tanks or other types of disposal systems may come under the control of Conservancy Boards in charge of rivers or catchment areas and the necessary approvals may be required before installation.

# Transport

## INTRODUCTION

### Transport

In this section the various aspects of transport are considered, which are applicable to more than one type of building. These aspects affect the planning of buildings and the layout of sites. The vehicles considered range from prams and cycles to commercial vehicles and buses.

Certain of the smaller vehicles mentioned, such as prams and push-chairs, have to be brought right into buildings and information is therefore given regarding door widths, storage space and so on.

For mechanized vehicles information includes: dimensions of vehicles, drive widths, sizes for turning circles and details for garaging or storage and for parking. The sizes and requirements for garages are shown if applicable to more than one type of building, but when, as with bus stations and multi-storey garages, they form complete building types they are discussed in separate sections of this book.

The sizes for car parks and the number of garages required specifically for any one type of building or group of buildings will be given in the section of this book appropriate to that type of building if applicable.

Where the widths of drives and the diameters of turning circles are given, it should be noted that these are the requirements for the particular vehicle under consideration. In most cases the dimensions should be based upon the largest size of vehicle which is likely to use the driveway.

The information given is for use in the layout of sites and is not suitable as a basis for the design of public roads, where regulations exist for the determination of road widths.

There are several Acts of Parliament and a considerable number of statutory regulations and orders which set out specific requirements as to vehicle sizes and as to storage of petrol and these have direct bearing on the design of buildings and layouts connected with motor vehicles. A licence is required for the storage of petrol if more than three gallons is stored and if it is in containers exceeding one pint each.

SIZES OF PRIVATE CARS: SELECTED DATA

| Make and Model | Wheelbase | Track F | Track R | Overall Length | Overall Width | Overall Height | Road Clearance | Turning Circle |
|---|---|---|---|---|---|---|---|---|
| | ft in | ft in | ft in | ft in | ft in | ft in | in | ft |
| **ARMSTRONG SIDDELEY** Star Sapphire | 9 6 | 4 9⅝ | 4 9½ | 16 2 | 6 2 | 5 2 | 8½ | 38 |
| **AUSTIN** A.35 | 6 7¼ | 3 9¼ | 3 8¾ | 11 4⅜ | 4 7 | 4 11 | 6⅝ | 35 |
| A.95 | 8 9¾ | 4 3½ | 4 3¼ | 15 1 | 5 4 | 5 2 | 7 | 40 |
| **BENTLEY** Series S | 10 3 | 4 10 | 5 0 | 17 7¾ | 6 2¼ | 5 4 | 7 | 41⅝ |
| **DAIMLER** One-O-Four | 9 6 | 4 8 | 4 9 | 16 4 | 5 10½ | 5 3 | 7 | 42 |
| **FORD** Popular | 7 6 | 3 9 | 3 9 | 12 8¼ | 4 8¼ | 5 4 | 8⅞ | 34¾ |
| Zephyr | 8 11 | 4 5 | 4 4 | 14 10½ | 5 8⅞ | 5 2 | 6⅝ | 36 |
| **HILLMAN** Minx Series III | 8 0 | 4 1 | 4 0½ | 13 7 | 5 1 | 4 11½ | 7 | 36 |
| **HUMBER** Hawk | 9 2 | 4 8 | 4 7½ | 15 4¾ | 5 9¾ | 5 1 | 7 | 39 |
| **JAGUAR** Mark VIII | 10 0 | 4 8½ | 4 10 | 16 4½ | 6 1 | 5 3 | 7½ | 36 |
| **M.G.** Magnette | 8 6 | 4 3 | 4 3 | 14 1 | 5 3 | 4 10 | 6½ | 37½ |
| **MORRIS** Minor 1000 2-door | 7 2 | 4 2⅝ | 4 2 5/16 | 12 4 | 5 1 | 5 0 | 6¾ | 33 |
| Oxford Series III | 8 1 | 4 5½ | 4 5 | 14 3 | 5 5 | 5 3½ | 6¼ | 35½ |
| **RILEY** Two-Point-Six | 9 5½ | 4 6⅝ | 4 6½ | 15 5½ | 5 7 | 5 1 | 6½ | 40¼ |
| **ROLLS-ROYCE** Silver Cloud | 10 3 | 4 10 | 5 0 | 17 7¾ | 6 2¼ | 5 4 | 7 | 41½ |
| **ROVER** 90 | 9 3 | 4 4 | 4 3½ | 14 10¼ | 5 5⅝ | 5 3¾ | 7¼ | 37 |
| **STANDARD** Eight | 7 0 | 4 0¼ | 4 0½ | 11 10 | 4 10 | 4 11 | 6 | 32 |
| Vanguard | 8 6 | 4 3½ | 4 3½ | 14 4 | 5 7½ | 5 0 | 7¼ | 35 |
| **SUNBEAM** Rapier | 8 0 | 4 1 | 4 0½ | 13 6½ | 5 1 | 4 10½ | 5¾ | 36 |
| **VAUXHALL** Victor | 8 2 | 4 2 | 4 2 | 14 0 | 5 2½ | 4 9½ | 6⅝ | 34 |
| Cresta | 8 9 | 4 6 | 4 6 | 14 10 | 5 8½ | 4 9 | 6¾ | 36 |
| **WOLSELEY** Six-Ninety Series III | 9 5½ | 4 6¾ | 4 6½ | 15 8 | 5 7 | 5 2 | 7⅛ | 40¼ |

### Drives and Turning Circles

The minimum drive width should be 8ft. to allow a car to pass a person in the drive and a greater width is very desirable.

Gateways should never be less than 7ft. 9in. wide in the clear.

The minimum turning radius which should be provided for private cars is 17ft. 6in. to the outside of the roadway, but 25ft. is a more satisfactory allowance for road curves as it reduces the risk of damage to grass and kerbs and to the wings of the car by contact with boundary walls.

The construction of drives should be sufficiently strong to permit moderately heavy traffic up to about 2-ton loads to pass over it without damage to the surface or foundations. Special heavy manhole covers and gullies are required for the same reason. Slight camber and falls to drainage gullies are needed; the former should be at least ¼in., and preferably ½in., for each foot of width between the centre and the edge of the roadway.

Two lines of stone flags in gravel drives spaced at about 4ft. 6in. centres, to take the average track of motor vehicles, save considerable expense for re-topping and work with rollers. Some form of edging or kerb is desirable to prevent damage.

Fig. 2 A illustrates the minimum width which should be used if the roadway is sunk between kerbs; if kerbs are used proper drainage to gullies is essential, although it is in all cases desirable.

It should be noted that the car track, which is the width between the centres of tyres, averages 4ft. 8in. for exceptionally wide commercial vehicles, which are unlikely to use private house approach roadways.

### Drives on Sloping Sites

If gradients are necessary they should be reduced as much as possible and 1 in 12 should be regarded as a maximum.

A slope towards the doors of a garage needs special care to prevent water running past any outside gully and entering under the doors.

A sufficiently wide external flat space must also be provided to allow the doors to open if they are large and side-hung, opening outwards.

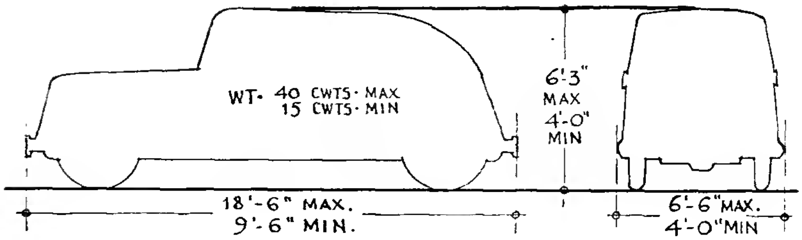



Fig. 1 Maximum and minimum sizes of private cars

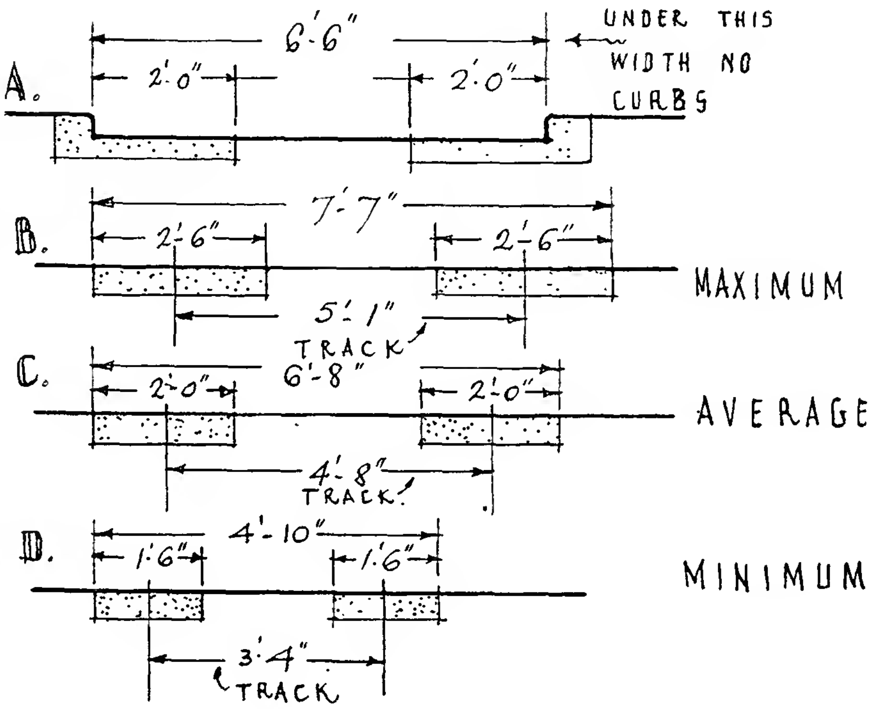



Fig. 2 Private garage ways

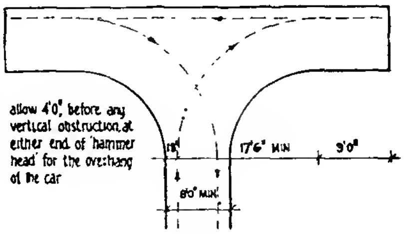



Fig. 3 " Hammer heads

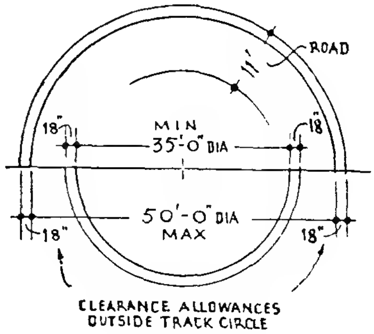



Fig. 4 Turning circles

# Transport

## PRIVATE CARS

### Garages

Motor-cars vary in length from about 9ft. 6in. to 18ft. 6in. overall, but for general purposes a length of 16ft. in the clear may be assumed for a private garage. Car widths vary from 4ft. 3in. up to 6ft. 6in. At least 18in. extra should be added to these widths to allow the car doors to be opened and for circulation round the car.

Fig. 5 A shows average dimensions for use with all but exceptionally large cars, and in Diagram B the dimensions will cater for the largest private motor-cars made in this country. These dimensions should be enlarged wherever possible, particularly to provide for storage and bench space. The figure also suggests suitable door widths, the dimensions given being in the clear between frames. Few private cars exceed an overall height of 7ft. and doors with a clear opening height of 7ft. 6in. are satisfactory. The width of a garage for two cars, Diagram C, may be slightly less than double that housing only one, but it should not in any circumstance be less than 14ft.

Fig. 6 shows in detail a garage 16ft. long by 11ft. wide. These dimensions allow for all except the largest cars and for a bench and shelves at the side of the garage. A batten fixed on the floor is useful to prevent overrunning when driving into the garage. It is desirable that a window be provided, the position of which is dependent on the proximity of adjoining buildings but should be such that it lights the part of the garage away from the doors. Where electricity is available a lighting point should be installed in a position approximating to that shown in the diagram, and also a power plug. Doors, when opening outwards, are better in four folds rather than as a pair, since they occupy when open, less space: when slide-inside types are used they must of necessity be in narrow widths. There should be a slight fall on the paving at the entrance to lead water away from the garage floor, which itself should be level.

In larger houses and where the site frontages permit, garages may be associated with the individual house, either as a separate building or attached to or forming part of the house itself. When a chauffeur is employed, garages may with advantage be at some distance from the house, especially if living quarters are attached or planned over the garage, but when the vehicles are owner-driven, the garage should be close to the house and, if possible, it should be in close proximity to an entrance. By the use of an attached garage additional bedroom floor area may be provided, if needed, by building over the garage; if, however, rooms are to be built over the garage, a fire-resisting floor, and, if possible, a floor resistant also to petrol fumes, is essential. If the garage is incorporated within the walls of the house, no direct communication is allowed in most districts, but it is sometimes possible to arrange a ventilated lobby between the garage and the house proper. Great care must be taken in all circumstances to reduce fire risks due to petrol storage. Detached garages should have roofs which will delay fire if they are planned near houses.

Ventilation should be provided in all garages at a low level to remove heavy fumes, in addition to high-level ventilators for general ventilation of the space.

### Washing Spaces

These are better placed out of view from the approaches to a house, although this is frequently impossible on a small site unless doors are provided at each end of the garage and the car is driven out to a space at the back for washing purposes. The washing space should be made of concrete, with a smooth surface laid to fall to a gully which is best placed centrally, so that the person washing does not stand in running water. The regulations for gullies vary in different districts. Some allow drainage to stormwater drains with an ordinary gully, especially if provision is made for one car only. Some require petrol gullies, and others require the drain to be into the soil system, either with or without special gullies.

A good size for a washing space is 10ft. wide and 20ft. long, so as to ensure that hosed water cannot splash dirt and mud on to the car from surrounding walls or other surfaces.

### Benches

A work bench with shelves above and a cupboard beneath is a valuable addition to the garage, but care should be taken that it does not impede circulation round the car.

### General Construction and Equipment

Garages may be permanent or temporary structures, but, in the latter case, insurance rates are liable to be increased. Walls do not need plastering internally. Floors should be of a hard material such as concrete, which will not be damaged by oil or petrol waste. Ceilings, which may be of plaster or asbestos and composition board, should be provided to assist in keeping the building warm in winter and fire-resisting construction is needed if rooms are built over the garage. Floors should be level, so that car brakes may be released without risk of the car moving. A slight incline or run-up of about three-quarters of an inch in the width of the door frame stops rainwater driving under doors.

Windows should be placed so that light is thrown on to the engine, and doors need not be kept open during ing repairs. An economical arrangement is to glaze a side entrance door. Doors may be of various types. The two-door type opening outwards, and folding doors, require more space than those sliding sideways on overhead tracks or opening vertically. Roller shutters are occasionally used. If doors open outwards, hooks to hold them are essential. Some form of heating is desirable.

The placing of artificial lighting points so that light is provided at the bench and over the engine, is important. Two-way switches should be placed at each door if two points are provided. At least one plug point should be provided for a portable lamp, and an electric power point is desirable for charging batteries.

A cold water supply is needed for car-washing purposes and to avoid the risk of freezing, this connection is better inside the garage; the valve should be equipped for a hose connection. The addition of a lavatory basin is a great asset.

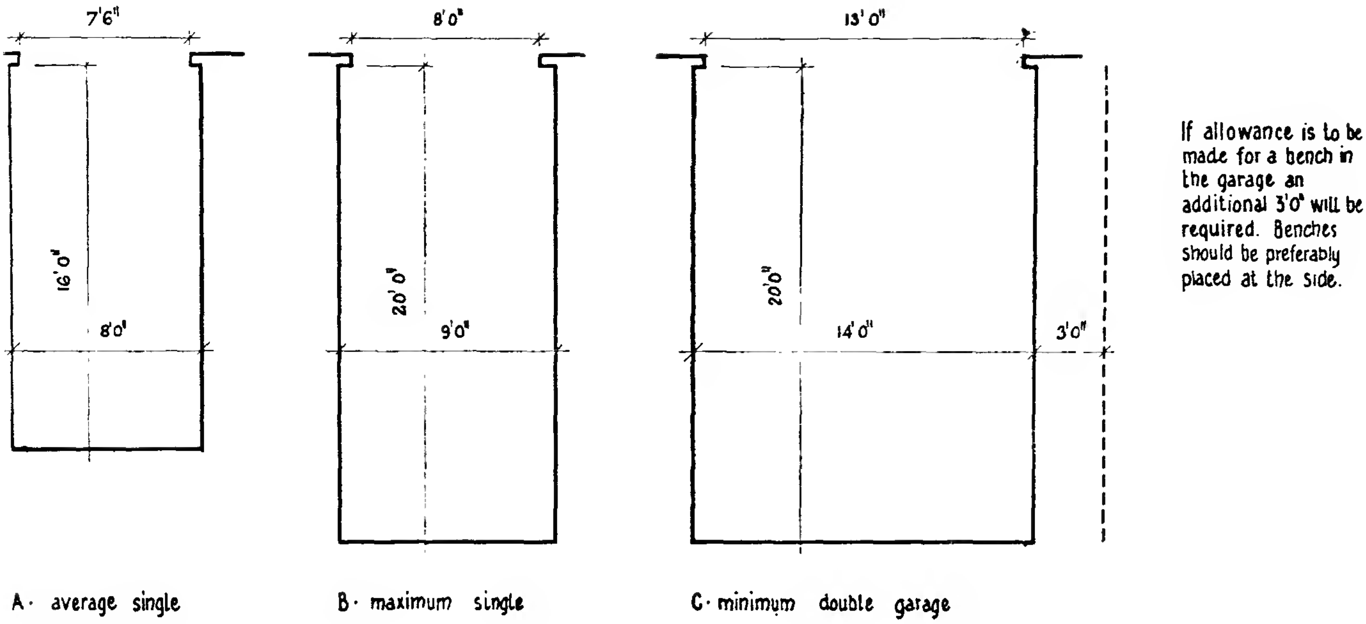



Fig. 5 Dimensions of private garages

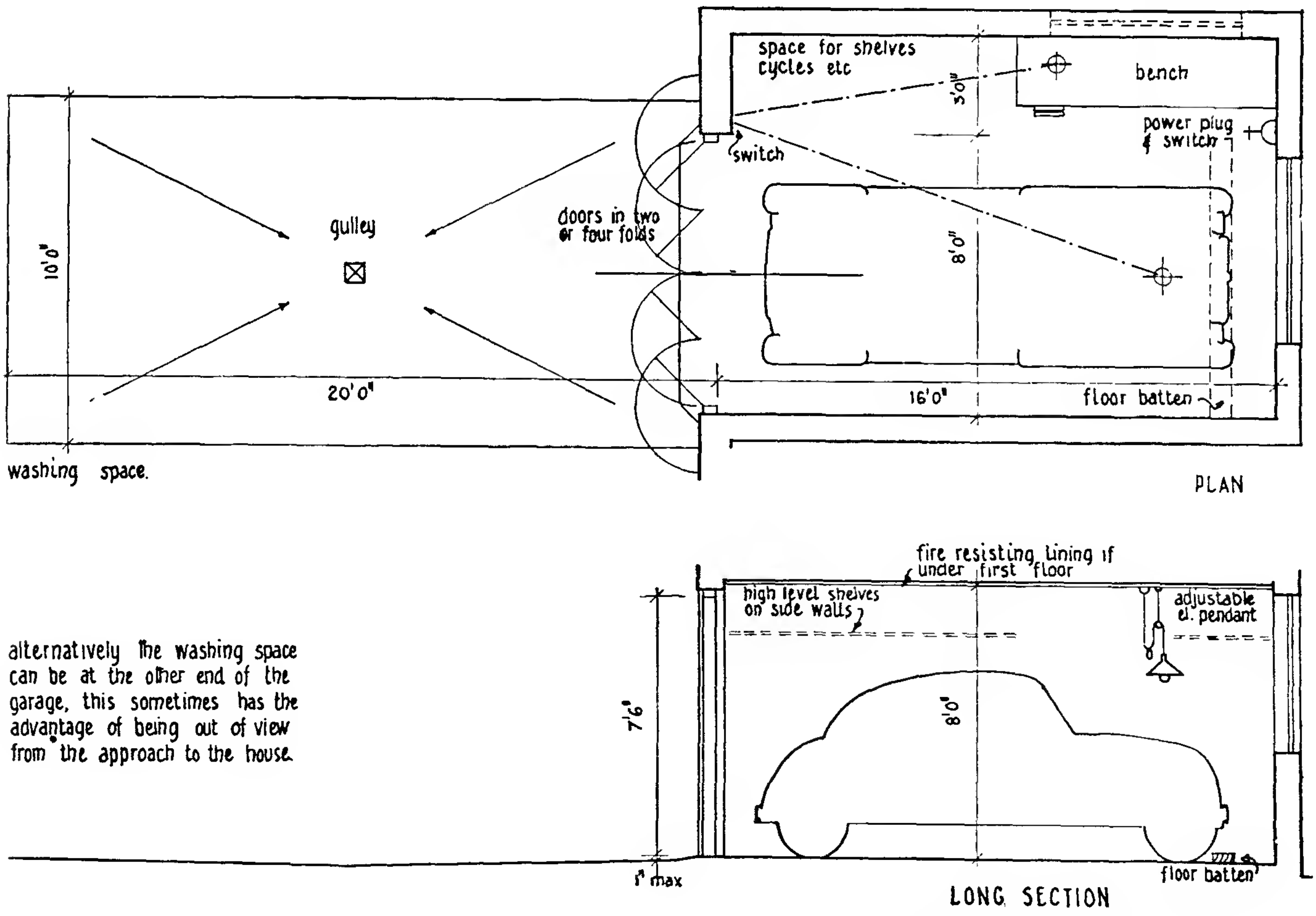



Fig. 6 Typical garage and washing space

PRIVATE CARS

### Lock-up Garages

In many districts where houses have insufficient space for individual garages, some other provision has to be made in the form of grouped garages which are frequently attached to a motor business or to a petrol or service station. Blocks of flats also adopt a similar system. Whenever possible, car owners prefer lock-up garages to standing spaces in a large covered or enclosed area. Such lock-up garages should be at least 8ft. wide by 20ft. long, permitting space for a bench in addition to the car, except with very large vehicles.

Fig. 7 illustrates a typical plan which is based on building regulations requiring the maximum length of a 9in. wall to be 30ft. and for intermediate cross walls to be only 4½in. thick. Local authorities vary considerably in regard to the type of construction they will permit for garage buildings of this type. Some districts require each compartment to be separated by a 9in. wall, others permit the scheme shown in the figure but sometimes ask for the 9in. walls to be carried up above the roofs if the latter are of timber construction; other authorities permit breeze dividing partitions and some others even permit 4½in. brick or concrete block walls throughout.

When a row of garages is constructed the turning space should be at least 20ft. and preferably 25ft. wide. A similar space is sufficient if garages are placed on both sides of the driveway; the whole of this space should be paved and laid to falls to act as washing space.

Such ranges of garages can be lighted and ventilated through the front wall which consists mainly of the entrance doors; these doors are, therefore, sometimes glazed.

Lock-up garages should have some heating facilities for winter which can be provided by means of a radiator system operated by a small independent coke boiler placed in a heating chamber.

In the case of flats, rows of garages may be heated from the general heating plant.

Lock-up garages attached to flats should be so placed that they are not near ground-floor windows as they are detrimental to letting value of flats. If possible, the garages and washing spaces should be screened.

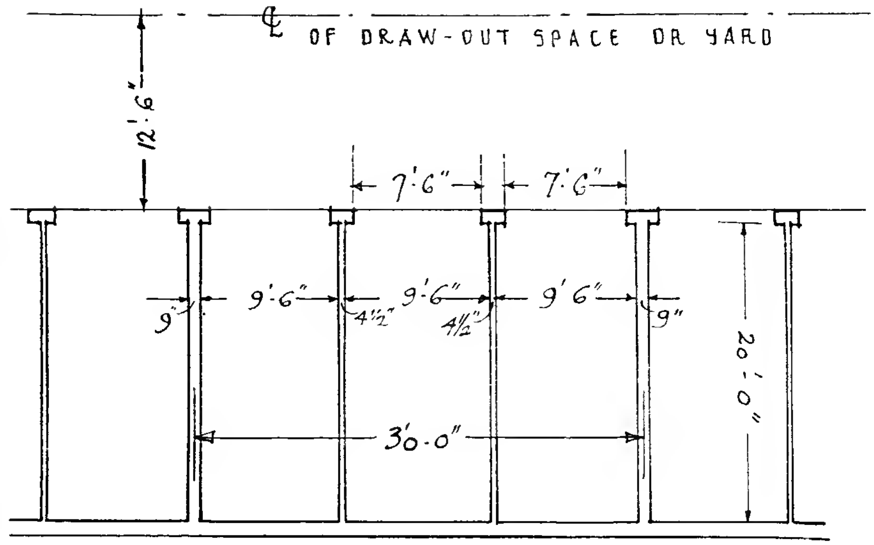



Fig. 7 Preferred sizes for lock-up garages; the minimum size allowing for a bench at the end is 20ft. by 8ft.

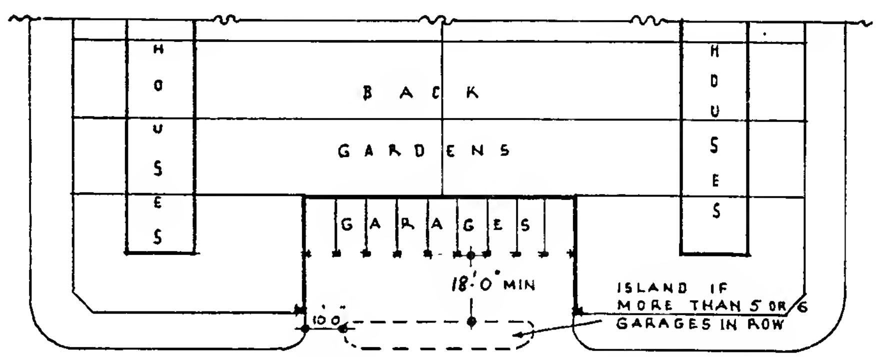



Fig. 8 Typical layout for garages on a road frontage

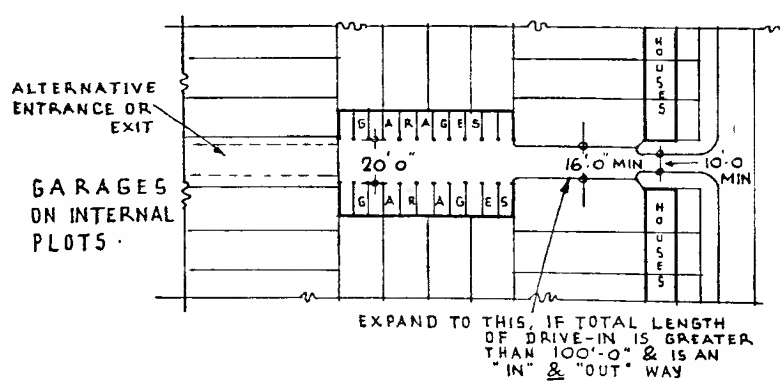



Fig. 9 Typical layout for grouped garages in residential areas, the minimum turning space of 20ft. is shown

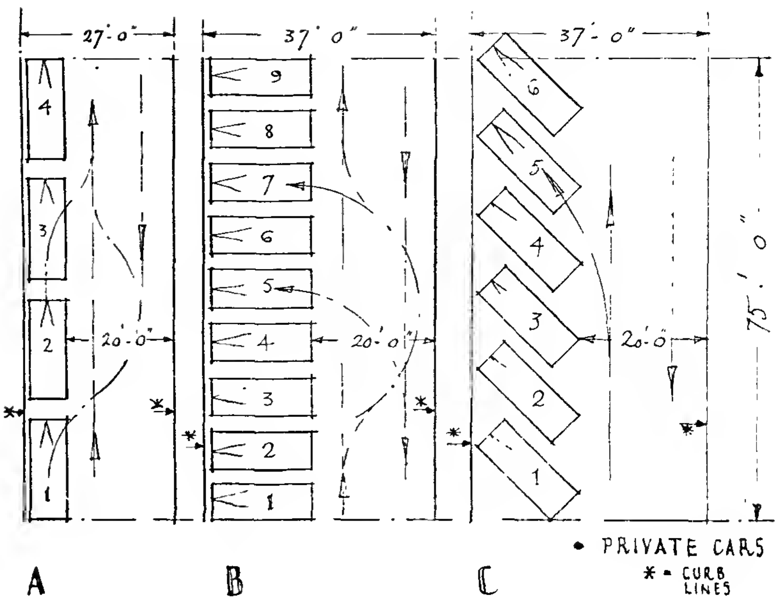
## Parking of Vehicles

Fig. 10 illustrates three methods of parking vehicles in streets or other places against a kerb or pavement.

Vehicles should never be placed in double rows on one side of a pavement owing to the difficulties involved in removing a car from the inner row before those in the other row have left. Fig. 10 also shows that the method of parking has to vary according to the width of the roadway available in order to leave a clear way at least 20ft. wide, in each type, for turning and for one line of cars to pass another in either direction. The figure also shows the number of vehicles which can be parked in each method against a given length of pavement. Type C is by far the easiest method of parking and of entering and leaving the park. Whenever possible it should be laid down that all vehicles park with the fronts of the cars facing in the same direction as this eases control greatly. The traffic lines of vehicles entering or leaving berths are shown on the diagrams together with suggestions as to the placing of the fronts of the cars; these details illustrate more clearly the problems involved in each type.

Fig. 11 illustrates a typical layout for parking on sites where large numbers of vehicles are expected. It is usual to adopt the layout shown, which is similar to that shown in Type C of Fig. 10, and to direct traffic so that there is continuous circulation between the car stands in one direction only. The rows of stands may be of unlimited length and when there are very large numbers of vehicles, signs placed on high posts should be used so that drivers may go quickly and easily to the right section: the parking system shown permits any car to leave without moving any other vehicle. Car stands should always be assumed to need a space 7ft. wide and 16ft. long with driving aisles 20ft. wide, or rather less if the diagonal layout is used as in Fig. 10 C, or Fig. 11. Car stands based on 16ft. lengths permit the parking of the few cars which are longer than the average without disturbing the normal spacing.

It should be particularly noted in Fig. 11 that vehicles are not parked on the roadway on the right of the diagram because every car using the park uses this road as a common exit.




A, parking parallel to the pavement, space must be left at each end of the vehicle
B, parking at right angles to the pavement, both lines of traffic are disturbed when a car is removed
C, the easiest method of parking

Fig. 10 Three methods of parking

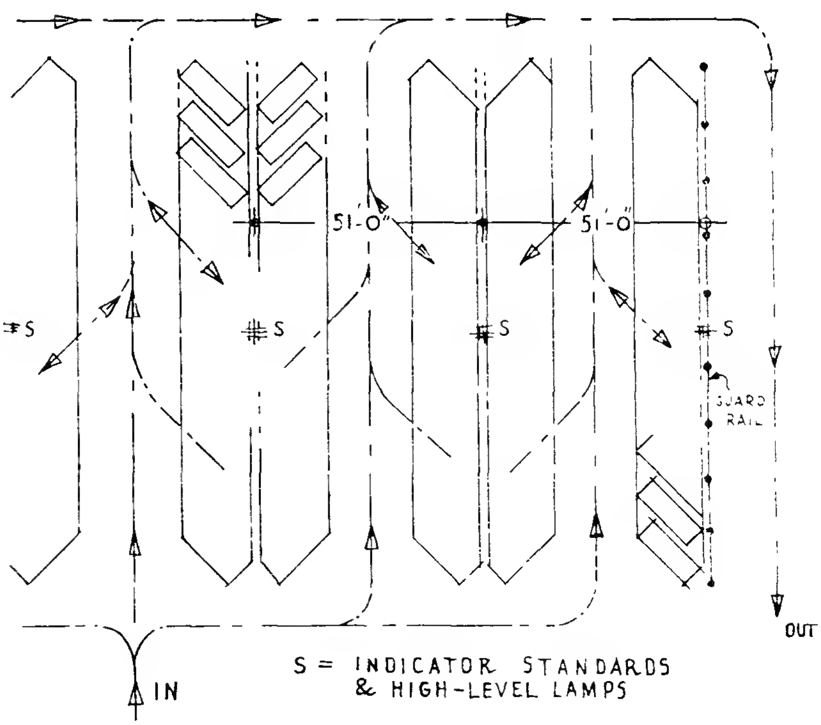



Fig. 11 Double bank parking; cars are arranged as in type C of Fig. 10

PRIVATE CARS

### Forecourt Parking

Many buildings are planned with entrance forecourts which provide facilities for parking a limited number of vehicles; also in some instances there are a number of public buildings which provide in open forecourts parking space for ceremonial occasions.

It is essential that traffic should travel in one direction only, with the entrance to and from the adjoining street very clearly marked. Entrance gateways, if provided, should not be less than 8ft. in the clear and preferably rather more, with separate side gates for pedestrians. Pavement crossings should not be more than 10ft. wide so that not more than one vehicle can enter at a time. The greatest problem arises in the arrangement of the parking in such a manner that any vehicle may come and go without crossing other traffic and having at the same time an easy return for picking up passengers at the entrance. Fig. 12 shows three typical layouts, but each has the same defects, namely, traffic having to cross other traffic or backing from some stands to the entrance when picking up.

The minimum sizes of such forecourts are determined by the minimum turning radius for the largest car and, therefore, the radius of the inside kerb of any part of the road should be at least 20ft. Roadways should be at least 20ft. wide so that two vehicles may pass one another easily. Pavements for pedestrians are frequently not provided in schemes of this sort and consequently a general spaciousness must be provided.

### Street Parking

Fig. 14 shows a suggestion for car parking in shopping areas. Any such system avoids interruption of normal street traffic and also provides considerably more parking stands than can be obtained by parking against a street kerb. This layout cannot be used for urban areas where site values are very high, but is very useful for suburban districts; such a layout overcomes a difficulty that prevents cars from being used for shopping in many areas—congestion of street traffic. The corner treatment is not only useful in dealing with the parking problem, but owing to the opening up at the junction, traffic from the side road has better visibility of the main road.

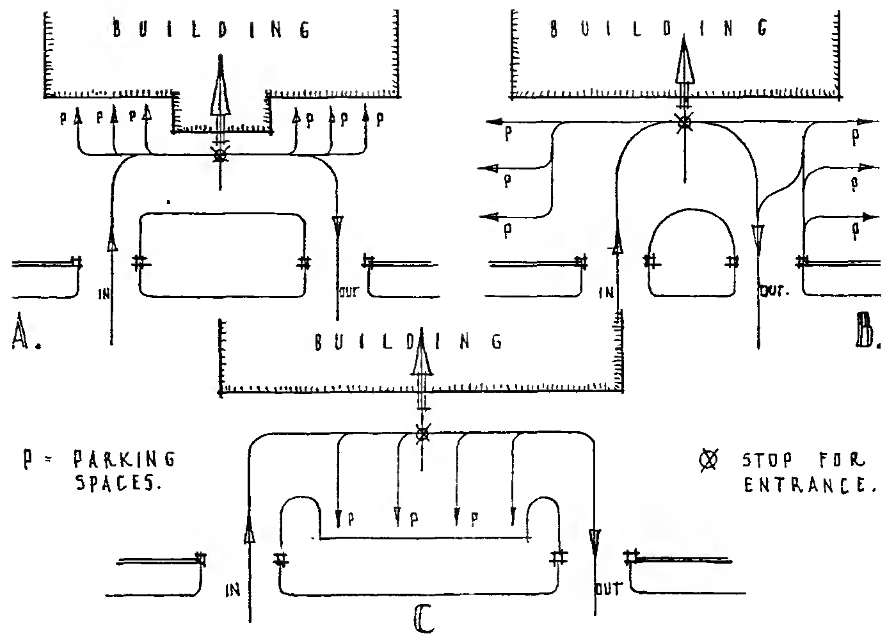
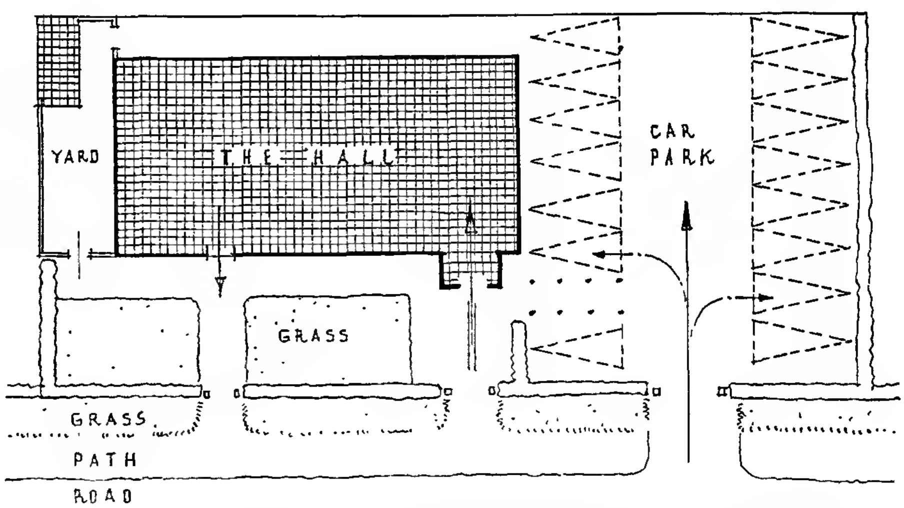
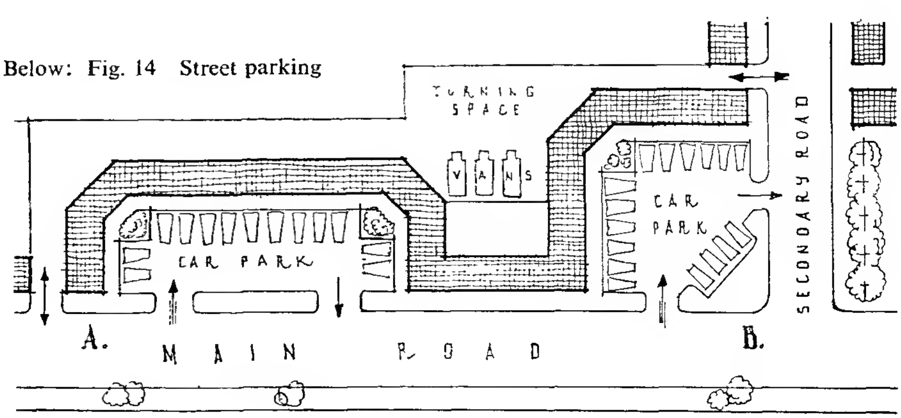



Fig. 12 Forecourt parking




Above: Fig. 13 Typical example of forecourt parking (village hall)

Below: Fig. 14 Street parking



## MOTOR CYCLES, SCOOTERS, MINIATURE CARS

### MOTOR CYCLES

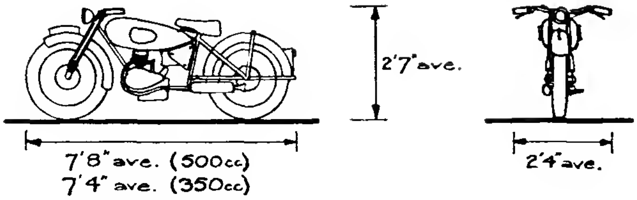



Fig. 15 Average sizes of motor cycles

SIZES OF MOTOR CYCLES: SELECTED DATA

| Make | Wheelbase | Turning circle |
|---|---|---|
| | in. | ft. in. |
| Royal Enfield Bullet, 500 c.c. .. | 54 | 12 9 |
| Velocette Mac .. .. .. | 52½ | 16 0 |
| B.S.A. B31 .. .. .. .. | 56 | 14 3 |
| Ariel, Red Hunter, 350 c.c. .. .. | 56 | 14 4 |
| Norton ES2 .. .. .. .. | 56½ | 16 6 |
| Triumph, Speed Twin .. .. | 55½ | 15 6 |
| B.S.A. B33 .. .. .. .. | 54½ | 15 0 |

Storage of motor cycles: racks at 3ft. 0in. centres.

### SIDECAR OUTFITS

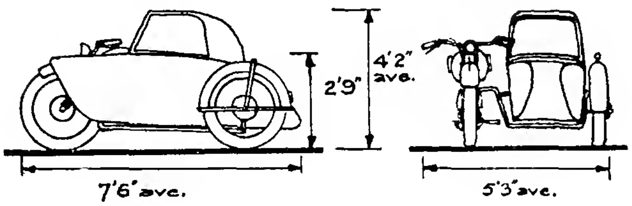



Fig. 16 Average sizes of sidecar outfits

SIDECAR OUTFITS: SELECTED DATA

| Make | Turning circles: Left hand | Turning circles: Right hand |
|---|---|---|
| | ft. in. | ft. in. |
| Norton 19S .. .. .<br>Canterbury Carmobile .. | 14 6 | 19 0 |
| Ariel Huntmaster .. .<br>Watsonian Ascot .. . | 15 4 | 18 8 |
| Ariel VB .. .. ..<br>Watsonian Maxstoke .. | 14 9 | 19 0 |
| Royal Enfield Meteor ..<br>Canterbury Victor .. .. | 14 9 | 20 6 |

### SCOOTERS

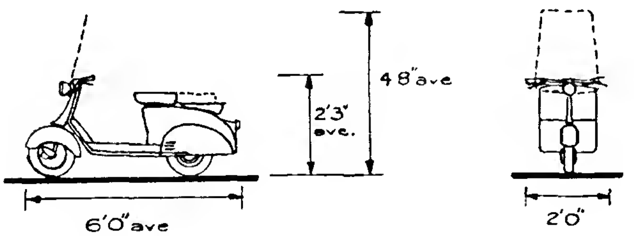



Fig. 17 Average sizes of scooters

SCOOTERS: SELECTED DATA

| Make | Wheelbase | Turning circle |
|---|---|---|
| | in. | ft. in. |
| Progress 200 c.c. .. . | 55 | — |
| B.S.A. Dandy .. .. . | 45 | — |
| Lambretta 150 c.c. . | 50½ | — |
| Vespa 145 c.c... . . .. | 46 | — |
| N.S.U. Prima .. . | 49½ | 9 7 |
| Zundapp Bella .. .. .. | 51½ | 13 6 |

### MINIATURE CARS

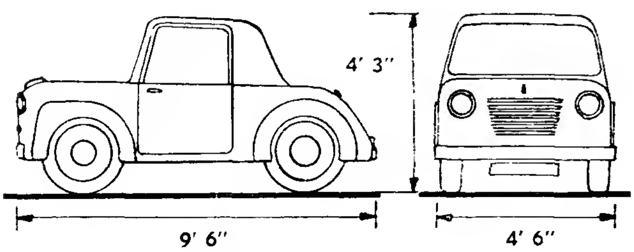



Fig. 18 Average sizes of miniature cars

MINIATURE CARS: SELECTED DATA

| Make | Wheelbase | Turning circle |
|---|---|---|
| | ft. in. | ft. in. |
| Astra .. .. .. . . | 6 2 | 22 0 |
| A.C. Petite .. .. .. . | 6 0 | — |
| Fairthorpe Atomota .. .. . | 6 9 | 27 0 |
| Goggomobil Regent 300 .. .. | 5 10¾ | 24 6 |
| Isetta 300 Standard .. .. .. | 4 10 | 30 0 |
| Reliant Regal .. .. .. .. | 6 2 | 24 0 |

## BICYCLES

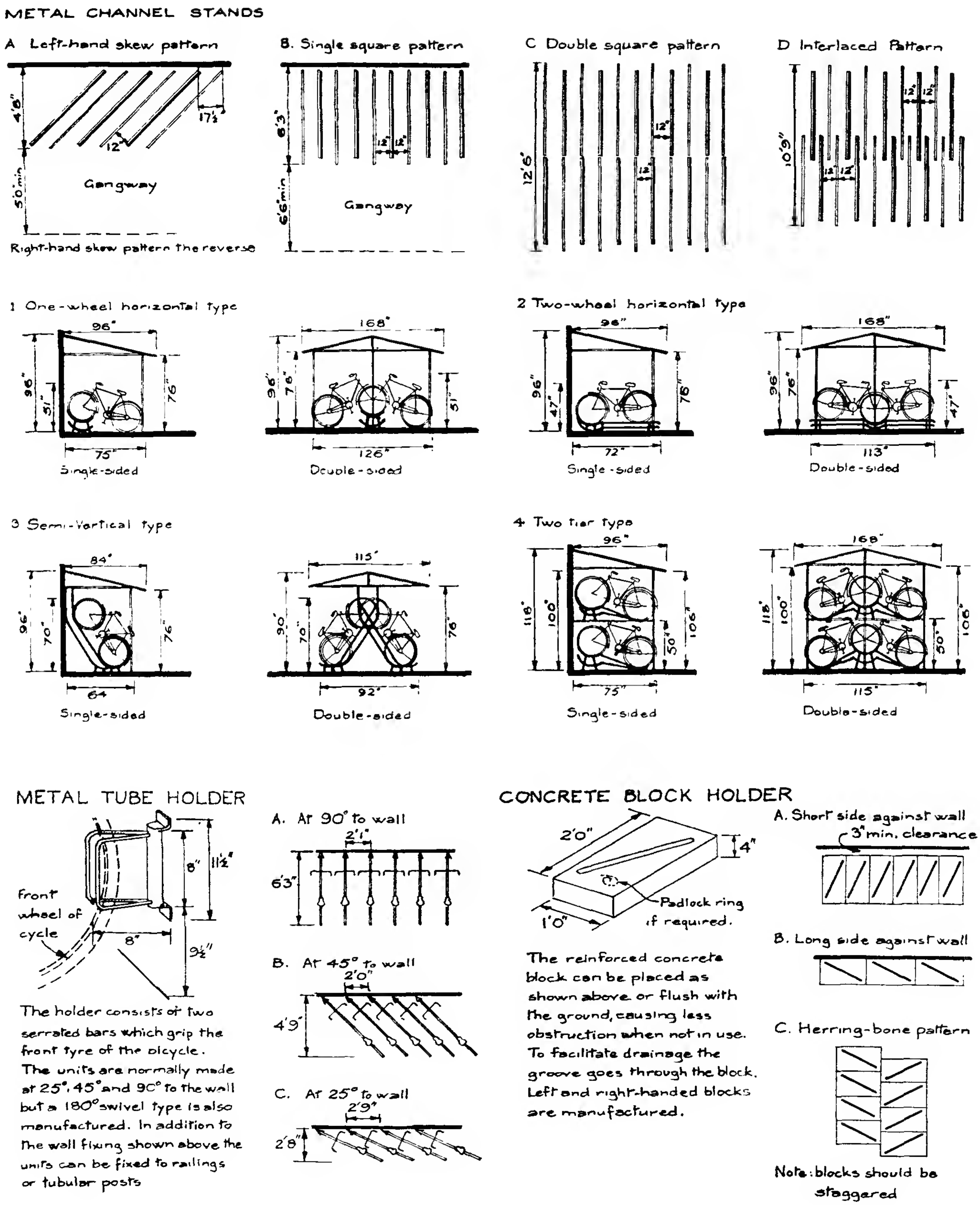



Fig. 19 Bicycle storage and parking: details of sheds, stands, etc.

## Pram Sheds

Sheds are needed in nursery schools, clinics, etc., in order that prams may be left under cover as it is undesirable to bring them into the waiting hall, nor should they be left haphazardly around the approaches to the building. It is essential for this storage space to be under cover and it is important that protection from rain be provided for both prams and contents, such as bedding or wraps. It is better if the storage space is not only roofed but enclosed. Fig. 20 gives the essential information for designing perambulator storage. The average perambulator needs a space about 4ft. long and 2ft. 6in. wide, to which should be added about 9in. for clearance. Gangways between rows of perambulators should be 6ft. wide to allow for turning space and for specially large types. The drawing also shows that if covered but open-sided storage is used the perambulators should be placed in the centre, with the roof overhanging about 4ft. from the fronts of the perambulators, which gives a 16ft. span for the double-sided type illustrated.

## Invalid Chairs

There are many types of invalid chair and they vary considerably in size and space requirements: the main types with their dimensions are shown in Fig. 21. Doorways for all types should be at least 2ft. 6in. wide, and preferably should be up to 3ft. wide so as to permit the use of occupant-propelled wheel chairs without grazing the users' hands and elbows; this type of chair could be turned in little more than its overall length.

Invalid chairs of the hand-operated mechanically propelled types, or the completely mechanically controlled chairs, need much greater turning space than do chairs of types which are propelled by the user. Sliding doors and double swinging doors are more easily operated by the occupants of invalid chairs than are side-hung doors.

Planning for the use of invalid chairs needs the complete avoidance of steps; when ramps are used at changes of level the gradient should be as little as possible and should not exceed 1 in 20.

Buildings designed specially for users of invalid chairs not only need wider doors but also wider corridors and generally increased areas in the rooms.

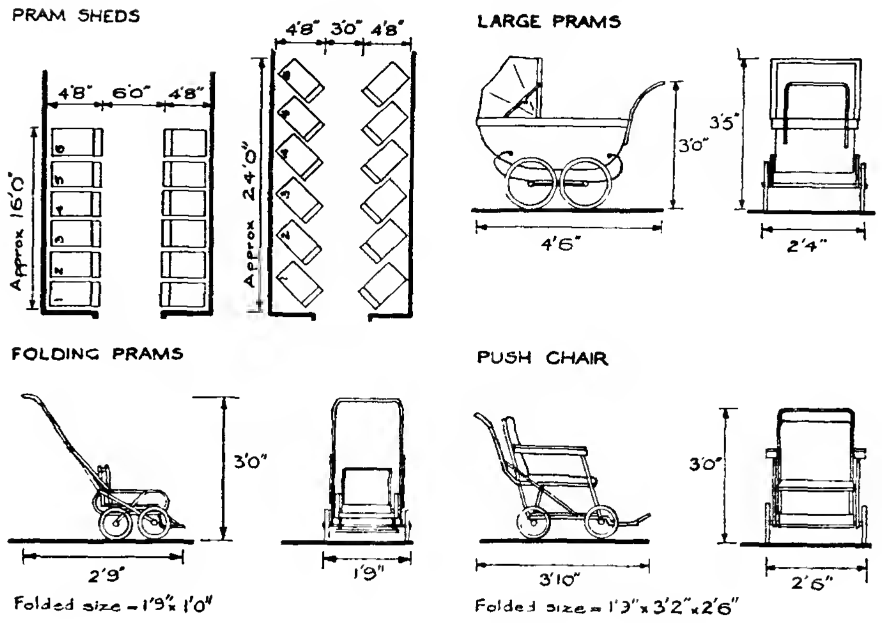



Fig. 20 Details of pram sheds, prams and push chairs

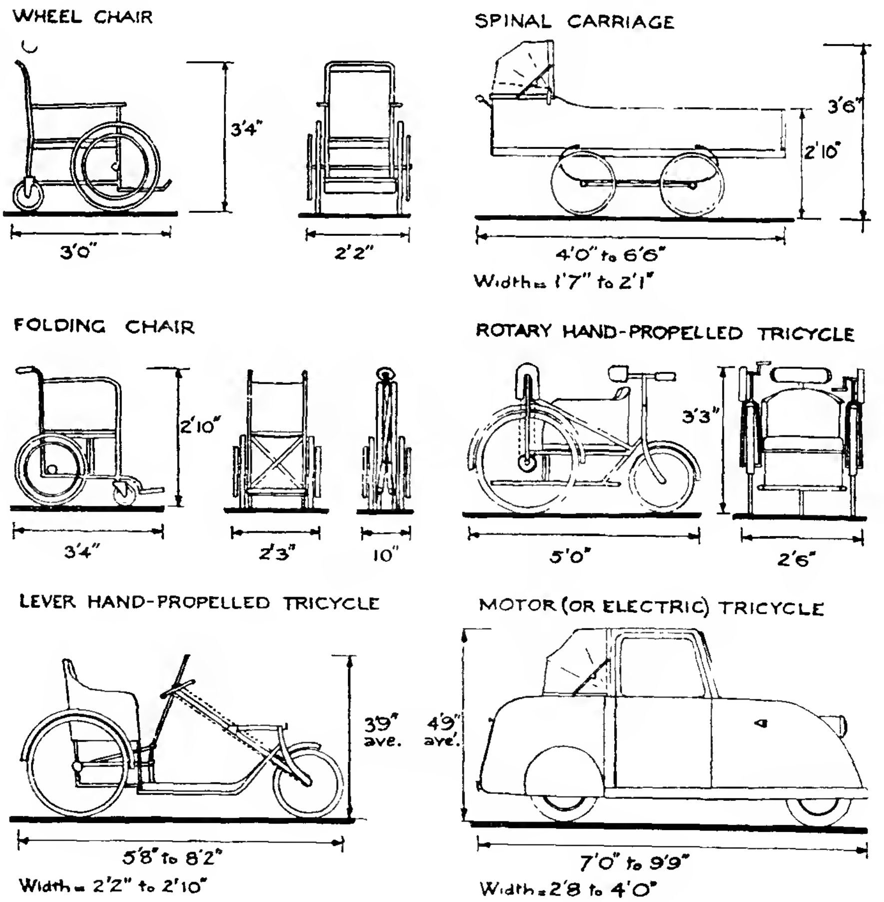



Fig. 21 Details of invalid chairs and carriages

# *Transport*

## COMMERCIAL VEHICLES

### Vehicle Sizes

The overall length of a motor vehicle with four wheels shall not exceed 27ft. 6in., or with more than four wheels 30ft., except articulated vehicles, which may be up to 33ft. in length. The overall width of motor tractors and heavy motor vehicles must not exceed 7ft. 6in. and the overhang beyond the back axle shall not exceed 7/24ths of the overall length of the vehicle. Trailers (excluding draw bar) shall not exceed 22ft. in length nor 7ft. 6in. in width. No motor vehicle which exceeds 26ft. in length shall draw a trailer. Trailers may not carry passengers.

### Loading

The unladen weight of a heavy motor vehicle must not exceed 7¼ tons with four wheels, 10 tons with six wheels, and 11 tons with more than six wheels. The sum of road weights transmitted to the road surface by a heavy motor vehicle and a trailer together shall not exceed 32 tons. The weight transmitted by any one wheel of a heavy motor-car shall not exceed 4 tons, and the sum of the total load transmitted to the ground by all the wheels of a heavy motor-car shall not exceed 12 tons if the vehicle has four wheels, 19 tons if six wheels and 22 tons if more than six wheels.

### Heights

No regulations appear to have been made in regard to height of all vehicles, but the Ministry of Transport have fixed 16ft. as the minimum clearance space underneath bridges over roads.

### Turning Space

A very important factor in planning for commercial vehicles is the space in which the vehicle can make a complete turn without reversing. Single driveways must accommodate ordinary motor vehicles without the possibility of their having to reverse.

### Garaging

When single commercial vehicles are to be housed the garages are usually similar to those for private cars, excepting for necessary increases in dimensions. Where a number of vehicles belong to a single organization, large covered garages are usual, together with workshops. A height of 15ft. should be assumed as a maximum for commercial vehicles.

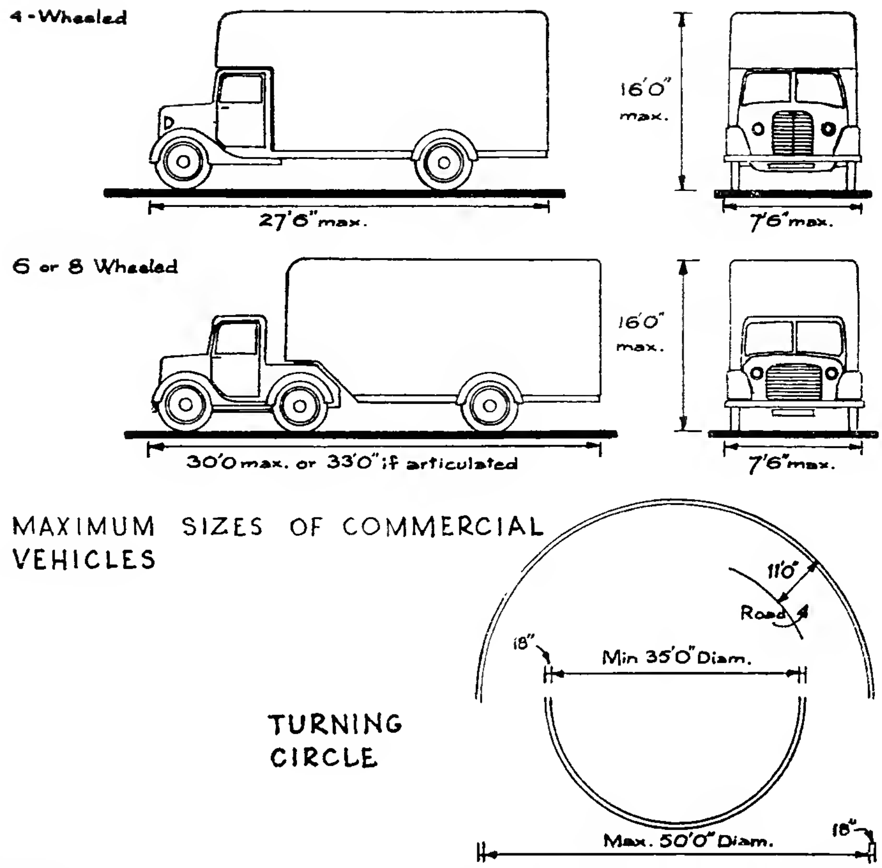



Fig. 22 Details of commercial vehicles

Clearance allowances outside track circle

THE SIZES OF COMMERCIAL VEHICLES: SELECTED DATA

| Make and model | Max. laden weight (lb.) | Wheel-base (ft. in.) | Overall length (ft. in.) | Turning circle (ft. in.) | No. of axles |
|---|---|---|---|---|---|
| A.E.C. Mandator, Mk. III | 26,880 | 16·7 | 22·11 | 63·0 | 2 |
| A.E.C. Mammoth, Major Mk. III | 47,040 | 18·9½ | 30·4½ | 69·0 | 3 |
| A.E.C. Mammoth, Major Mk. III | 56,000 | 18·9½ | 30·0 | 69·0 | 4 |
| Bedford, CA | 3,700 | 7·6 | 12·8 | 35·0 | 2 |
| Bedford, SLZO | 22,480 | 13·0 | — | 53·0 | 2 |
| Commer, 5-ton Superpoise | 19,500 | 13·11 | 22·4 | 50·0 | 2 |
| Commer, 7-ton Superpoise | 24,000 | 13·6 | 23·8 | 58·0 | 2 |
| Foden, OG 4/6 tipper | 19,000 | 8·0 | 13·8½ | 36·0 | 2 |
| Foden, FG 6/7½ | 26,880 | 13·9 | 23·7 | 52·0 | 2 |
| Foden, FG 6/12 (standard) | 44,800 | 16·1 | — | 64·0 | 3 |
| Foden, FG 8/15 (side-tipper) | 49,280 | 13·2¼ | 29·0 | 76·0 | 4 |
| Ford, Thames 5-cwt. van | 2,400 | 7·3 | 11·3 | 32·9 | 2 |
| Ford, Sussex 6-wheeler | 25,200 | 14·10 | — | 66·0 | 3 |
| Karrier, "Derby" refuse collector | — | — | 16·5 | 32·0 | 2 |
| Karrier, Moving floor collector | — | — | 16·10 | 32·0 | 2 |
| Karrier, Sweeper and collector | — | 9·2 | 17·8 | 35·8 | 2 |
| Morris, Commercial "J" type van | 3,020 | 7·2 | 11·8 | 35·0 | 2 |
| Morris, Commercial FVS 12/5 | 18,480 | 12·6 | 20·8 | 53·0 | 2 |
| Scammell, rigid 8-wheeler | 49,280 | 17·3 | 30 0 | 75·0 | 4 |
| Thornycroft, Trusty RF/WR6/MV | 56,000 | 18·4 | 29·9 | 76·0 | 4 |

### Dimensions

All buildings, parking spaces and turning spaces associated with public-service vehicles are necessarily related to maximum dimensions laid down in regulations made under legislation, of which the most important is the Road Traffic Act of 1930 and of 1934. It is wise in this kind of planning to assume that at some time maximum conditions may arise; since, unless this is done, changes in the types of vehicles from those for which provision is originally made in a scheme may involve very costly changes in both buildings and layout.

The legal maximum limits for public-service vehicles are:

Width—8ft. 0in. excluding mirrors and trafficators.
Length—*a.* 30ft. 0in. single deck.
*b.* 30ft. 0in. four wheel, double deck.
*c.* 30ft. 0in. six wheel, double deck.
Height—15ft. 0in.
Turning circles—60ft. 0in. for 27ft. length and under.
66ft. 0in. for length over 27ft.
Weight—12ton for four wheels.
14ton for six wheels.
8ton per axle max.

It must be borne in mind that the position of entrances to vehicles varies; most double-deck vehicles have entrances near the rear, but most single-deck vehicles have entrances arranged near the front of the passenger part of the vehicle; both types of entry are on the left, or near side of the vehicles. The Ministry of Transport has laid down 16ft. as the minimum clearance under bridges over new roads and, in fact, 16ft. 6in. is preferred. Many buses in the past have not been built up to the maximum permitted heights but there is an increasing tendency to approach this figure, in new types, to assist internal head-room. It is, therefore, wise to design all openings or covered spaces used by public-service vehicles not less than 15ft. in the clear.

Articulated vehicles have not so far been used in this country for public-service purposes; in many other countries, however, the use of this type is common and in consequence provision has often to be made for vehicles up to 65ft. in length.

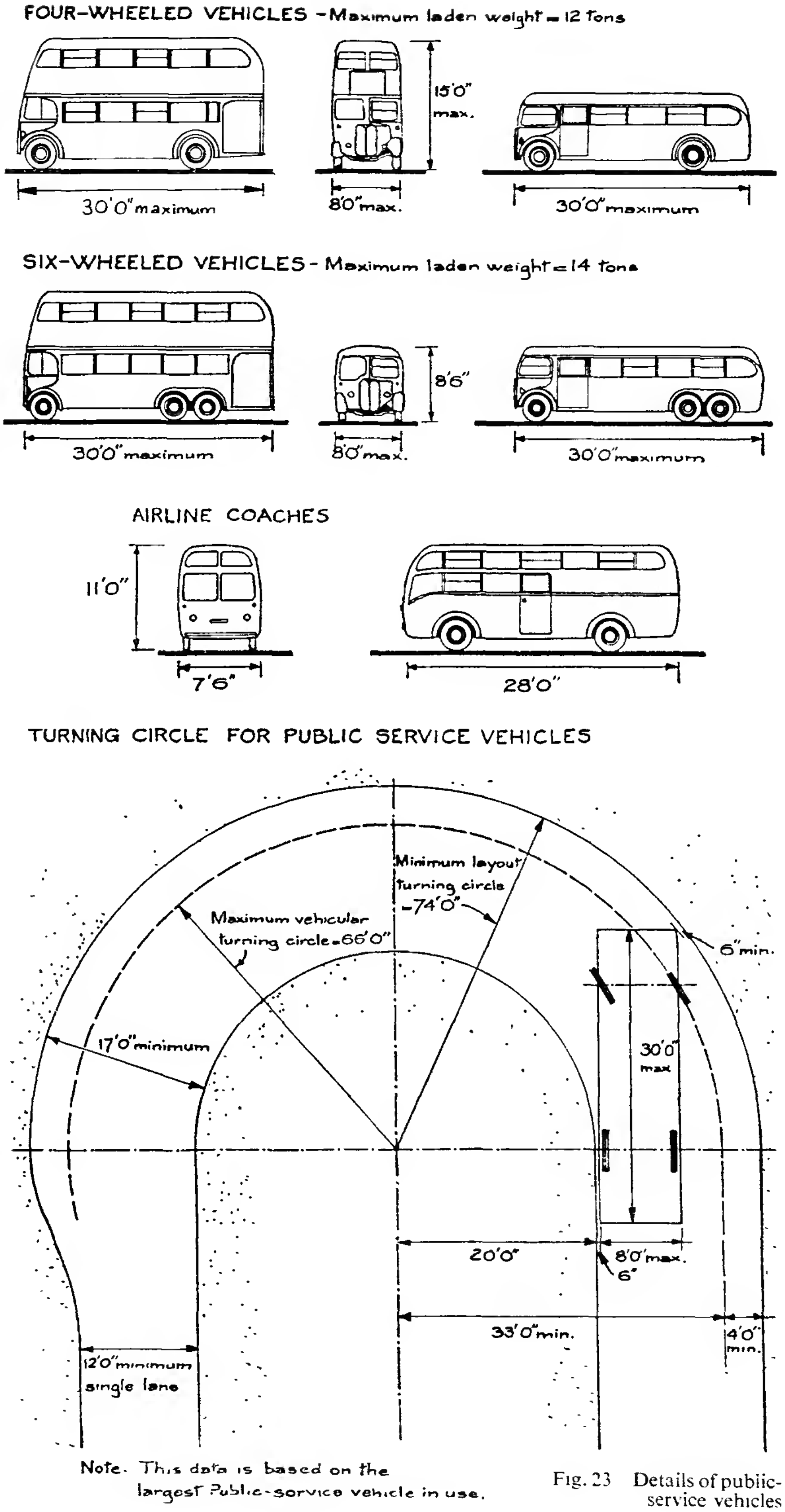



Fig. 23 Details of public-service vehicles

# CHILDREN'S PLAYGROUNDS

### Types of Playground

An adequate playground system should consist of three main types of playground in addition to playing fields:

(i) Many small sand pit playgrounds for toddlers up to five years. They should serve a maximum radius of 100yd., and the ideal is to have a small sand pit near every block of flats or group of houses.

(ii) A small number of large playgrounds within a quarter of a mile of every child of the 5-13 years age group. These should include not only a fitted playground but also a children's corner, a large sand pit, a paddling pool, at least one area for ball games and a wild area for camping.

(iii) An even smaller number of adventure playgrounds within a quarter to three-quarters of a mile of every young adolescent (13-15+), where the children can build houses with bricks and old timber.

### Swings

Chair-type swings are frequently provided for small children; with this type there is less risk of small children falling backwards. To avoid use by older children, chair swings should be of small dimensions (12in. wide only). Chair swings should be spaced 18in. apart and suspended 18in. above the ground from a cross-bar not exceeding 7ft. in height.

Swings for older children are usually arranged in sets of from three to eight, with uprights placed between every two or three swings.

A space of at least 4ft. is needed between each swing and a general height of 10ft. or 12ft. to the cross-bar should be allowed (*see* Fig. 1). The frames may be constructed either of wood, concrete, or galvanized iron tubing, the latter being the most satisfactory. Chains should be used to support the seats, which should have rubber buffers on the edges to prevent serious injury to the children. A good precaution is to mark the possible swinging area with white lines on the ground, outside which onlookers should stand.

### See-saw

This apparatus is generally used for smaller children. The longer and lower it is, the safer it becomes. It is usual to provide a plank 12ft. to 14ft. long, 10in. wide, and 2in. thick, with all ends and edges carefully rounded. The standard on which the plank swings and is fixed is generally 24in. high. On the underside of the ends of the plank should be fixed wooden, rubber-covered bumpers 8in. high.

### Rings

This apparatus is similar to the swing, but provides facilities for arm exercises. Rings should be at various heights, but 5ft. to 6ft. is a good average.

### Slides

These are always popular in play areas and have the advantage that there are no moving parts to go wrong. All but the smallest slides should be provided with a safety platform; this allows children to stand aside if, when reaching the top of the ladder, they feel uncertain about using the slide.

### Giant Stride

This apparatus consists of an upright galvanized steel tube 12ft. to 18ft. above the ground, with a pivoted head, to which are attached several ropes (usually four or eight). Knots must be made in the rope or wooden handles provided at intervals of about 18in. to prevent hands sliding down the ropes.

### Horizontal Bar

A good type of horizontal bar provides for the needs of children of various heights. The apparatus may be constructed of metal tubing, with the cross-bar of painted metal or, better, wood. A width of 5ft. per bar and heights varying from 4ft. to 6ft. should be allowed.

### Other Apparatus

Much other apparatus may be provided. Parallel bars, climbing ladders, and ropes are specially useful for gymnastic purposes, but these usually need proper supervision and organized use. On the Continent, provision is sometimes made for various entertainment apparatus, such as merry-go-rounds, slides, miniature motor-racing tracks, etc., for which charges are made. Slightly raised platforms of wood are sometimes provided for the smaller

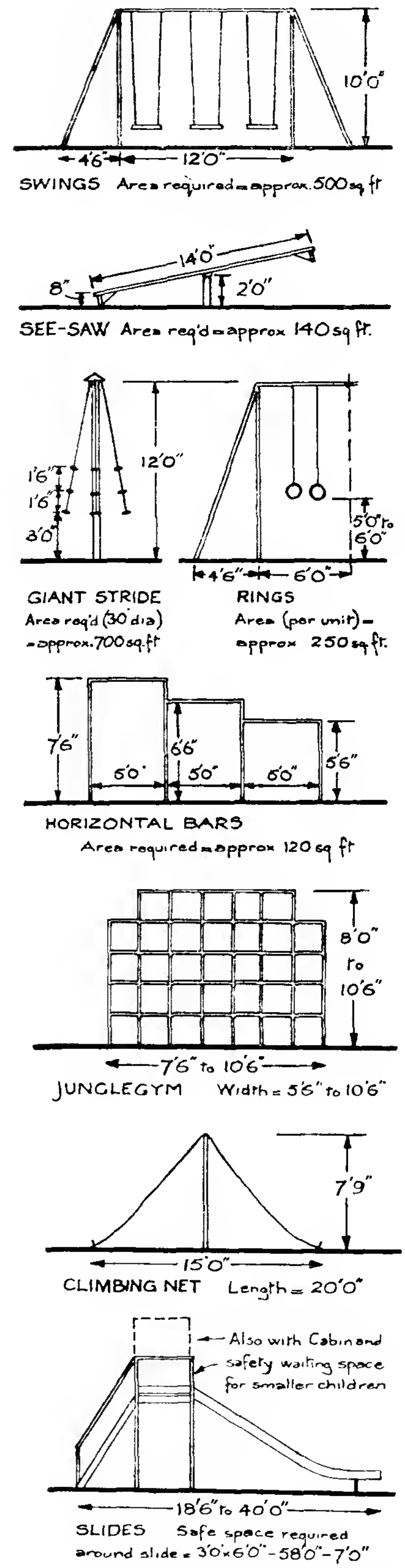


Fig. 1 Typical equipment for playgrounds

children to use for " floor games " and these stages are sometimes covered with a permanent roof on posts, or with adjustable canvas sun blinds.

### Sand Pits

Sand pits are better if constructed with wood or concrete surrounds rather than the sand being placed in holes in the ground. A properly constructed box facilitates the changing of the sand. The best sizes vary between 6ft. by 10ft. to 12ft. and 20ft. A shelf 10in. or 12in. wide should be fixed round the box to act as a seat and a modelling shelf, and also, by its extension over the sand area, to keep the sand from being spread over the surrounding space. Covers are desirable for protection at night, and may be provided either in the form of removable boarding placed on the seats or a permanent shelter. The latter permits the use of the sand pit in bad weather, but keeps the sun off the children when playing. Seats for adults overlooking the sand pit are desirable. The criticism that sand pits harbour vermin may be overcome by sprinkling the sand with a safe type of modern insecticide. Sand should be raked over every day, and be changed frequently, preferably monthly. Fig. 2 A and B shows two suggested sections for sand pits. One shows a wooden construction with a rammed earth bottom, and the other shows a concrete construction in tank form. If a tank form is used, care must be taken to provide for drainage of surface water from the bottom of the tank. All edges and arrises should be rounded to avoid all risk of personal damage.

### Paddling Pool

A paddling pool is a great attraction to children, both for its named purpose and for the sailing of model boats. The depth should vary from a few inches to about 15in. A good average size is 50ft. in diameter or its equivalent. An irregular shape is probably most attractive, although a rectangular one is undoubtedly less expensive to construct. A concrete walk should be arranged round the pool, and should be sloped away from it to prevent the return of soiled water to the pool. Seats for adults should be placed overlooking the pool. The best material for the construction of the pool is concrete, but it should not be finished very white in colour, as the reflections on sunny days are trying to children's eyes. Water should be kept running continuously to remove dirt and scum. This is frequently provided by means of an inlet through a fountain. Ample space in the form of a lawn should adjoin the pool. It is sometimes possible to form a shallow pool or trough through which the children walk before entering the pool, thus preventing dirt from being taken into the pool itself on the children's feet. Fig. 3 shows a good type of section for a concrete pool.

The small section shows a suggested sloping bottom to the pool at one end, so that the small children may enter easily and without risk of falling into the deeper water.

### Boating Pools

These pools are a great attraction to children, whether set in a children's playground or in a general park, and can usually be operated to show a reasonable profit. The pools may be any shape and size, but with water not exceeding 18in. to 2ft. in depth. Irregular shapes are generally to be preferred. The boats used are either miniature canoes, rowing-boats, hand-propelled paddle boats, or electric motor-boats. Natural pools may be used, but specially constructed concrete ones are better; in both cases wide concrete or stone surrounds are needed. Provision should be made for chaining up boats when not in use, either to the surround, in which case it should be lined with timber battening to prevent damage to the boats, or, better, to an island set in the centre of the water, thus placing the boats out of reach except to attendants equipped with waders.

### Adventure Playgrounds

It is not desirable nor possible to design these on paper. Essentially the adventure playground is made by the children themselves. As a basis for their work a secluded part of a site should be chosen, the ground should be left undisturbed, mounds and banks should be retained, for these provide the greatest attraction, sand or bricks left over from nearby buildings should be retained and unwanted tree stumps and so on should be dumped here.

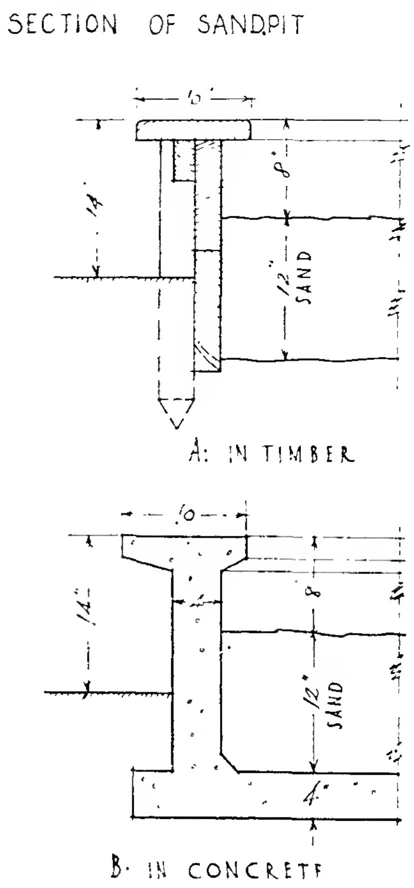



Fig 2 Two types of sandpit

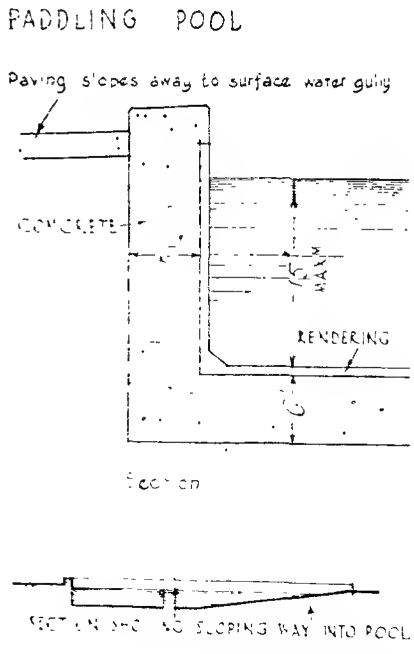



Fig 3 Typical paddling pool

## ADULTS' OUTDOOR RECREATION

### Athletic Ground

This ground should provide a running track and spaces for such exercises as jumping, throwing the javelin, etc. It is usual to lay out the running track round the outside of the ground, with spaces for other sports arranged within the shape of the track. The best length for the track is once round for a quarter of a mile, which is generally measured 12in. from the surrounding kerb. If possible a 200yd. section of straight track should be provided, but this is seldom realizable; it is usual, therefore, to provide a straight section 420ft. long on one side to permit events up to 120yd. The track should be 24ft. wide, thus providing six lanes for sprints and five for hurdles. The track, for reasons of economy, is sometimes reduced to 16ft. wide which provides for four lanes only. If a cycling track is needed this should be provided outside the running track when a circuit of three-and-a-half laps per mile can be planned; it should be 25ft. wide and be graded to super-elevations to form proper banking at the curved ends.

A good running track construction is, firstly a 6in. layer of coarse rubble or clinkers, secondly a 3in. layer of smaller clinkers, and, thirdly, a 4in. top dressing of finely screened clinker mixed with clay or loam to act as a binder. A kerb of wood or concrete should be provided on the inside edge of the track.

Fig. 4 shows a typical athletic ground laid out on the basis described above, but for some games a larger circumference may be needed.

It will be noticed that, as far as possible, all events finish in front of or towards the spectators' stand, which is situated at the centre of one of the long sides, preferably on the south or west side so that spectators do not face towards the sun.

The following details are given in connection with the particular requirements of such team games as are generally provided in public recreation centres in towns and cities.

### Rugby Football

The actual playing area is 330ft. long by 225ft. wide, with the addition of a space not exceeding 75ft. at each end for the touch-down space. At least 10ft. should be allowed at the sides of the field.

### Association Football

The playing area may vary from 300ft. to 390ft. long by 150ft. to 300ft. wide. The standard international field is 360ft. long by 240ft. wide. At least 10ft. should be allowed round the playing area.

### Hockey

The playing area is 300ft. long by 165ft. to 180ft. wide, round which at least 10ft. should be allowed.

### Netball

The "goals" consist of posts supporting nets 18in. in diameter, 10ft. above ground level. The full-size match court is 100ft. long by 50ft. wide, divided as shown in the figure. At least 10ft. should be allowed round the playing space. A small court is often used for practice games: it measures 70ft. by 50ft. and is marked out in a slightly different manner.

### Tennis

Various surfaces such as grass, asphalt, or patent hard materials are suitable. Fig. 4 shows the standard marking of a court, which is 78ft. long by 36ft. wide, to which must be added, as run-back, at least 21ft. at each end and 12ft. at the sides. The surrounding spaces are often reduced, except for special match courts. Where several courts are placed together in public recreation grounds, it is general to allow 120ft. in length, with 6ft. to 10ft. between courts. Courts need orientation to avoid the sun shining in players' eyes; north-east to south-west for the main axis is the best aspect for general purposes. Courts should be enclosed with galvanized wire fencing 10ft. to 12ft. high. Good drainage is essential.

### Cricket

The wicket is 22yd. long, and allowance in width should be made for several pitches side by side. The boundaries are to a great extent arbitrary, but a circle 450ft. in diameter should be allowed if possible (the size for county cricket is now 75yd. from centre of wicket to boundary). It is quite general to place the actual pitches on a square fenced "table" between football or hockey fields, to avoid damage during the winter months. Twenty-two persons play at one time, which is very few compared with the area occupied.

### Bowls

It is usual to make a bowling green 120ft. square, so that it may be played on in either direction. A single alley is 20ft. wide. The green should be surrounded by a trough 4in. deep and 8in. wide, covered with a slightly sunk wooden grating. The green is usually sunk below the normal ground level, not more than 18in., and is surrounded by a grass bank inclined at an angle of about 120°. Good drainage and good turf are essential.

### Croquet

A croquet lawn is 105ft. long by 84ft. wide: upon it are placed six hoops and a central peg in the approximate positions shown in the figure. The number of players does not exceed four.

### Clock Golf, Putting and Midget Golf

No special sizes or areas are required for these games. Frequently, however, clock golf is laid out in a circle 24ft. in diameter; there are 12 tees, with the hole placed nearer the circumference of the circle at one point. Putting and midget golf greens can be of any size, and can accommodate a large number of players at one time, as each tee and hole is separate.

Among other sports for which space may be required are the following: Archery, baseball, fives, golf and quoits. Some of these are more usually found in special parts of the country or attached to clubs. Golf is the only one frequently connected with public recreation grounds, but the requirements are considered to be beyond the scope of this section.

PLAYING AREAS

| Game | Area (sq. ft.) | No. of players | Area per player (sq. ft.) |
|---|---|---|---|
| Football (Soccer) | 108,000 | 22 | 5,000 |
| Football (Rugger) | 117,600 | 30 | 3,900 |
| Hockey | 64,000 | 22 | 3,000 |
| Netball | 8,400 | 18 | 466 |
| Tennis (1 court) | 7,200 | 4 | 1,800 |
| Bowls (1 alley) | 2,730 | 8 | 341 |
| Croquet | (Average) 8,820 | 4 | 2,205 |

*The table shows the full playing spaces and necessary surrounding areas required for various games compared with number of players*

## ADULTS' OUTDOOR RECREATION

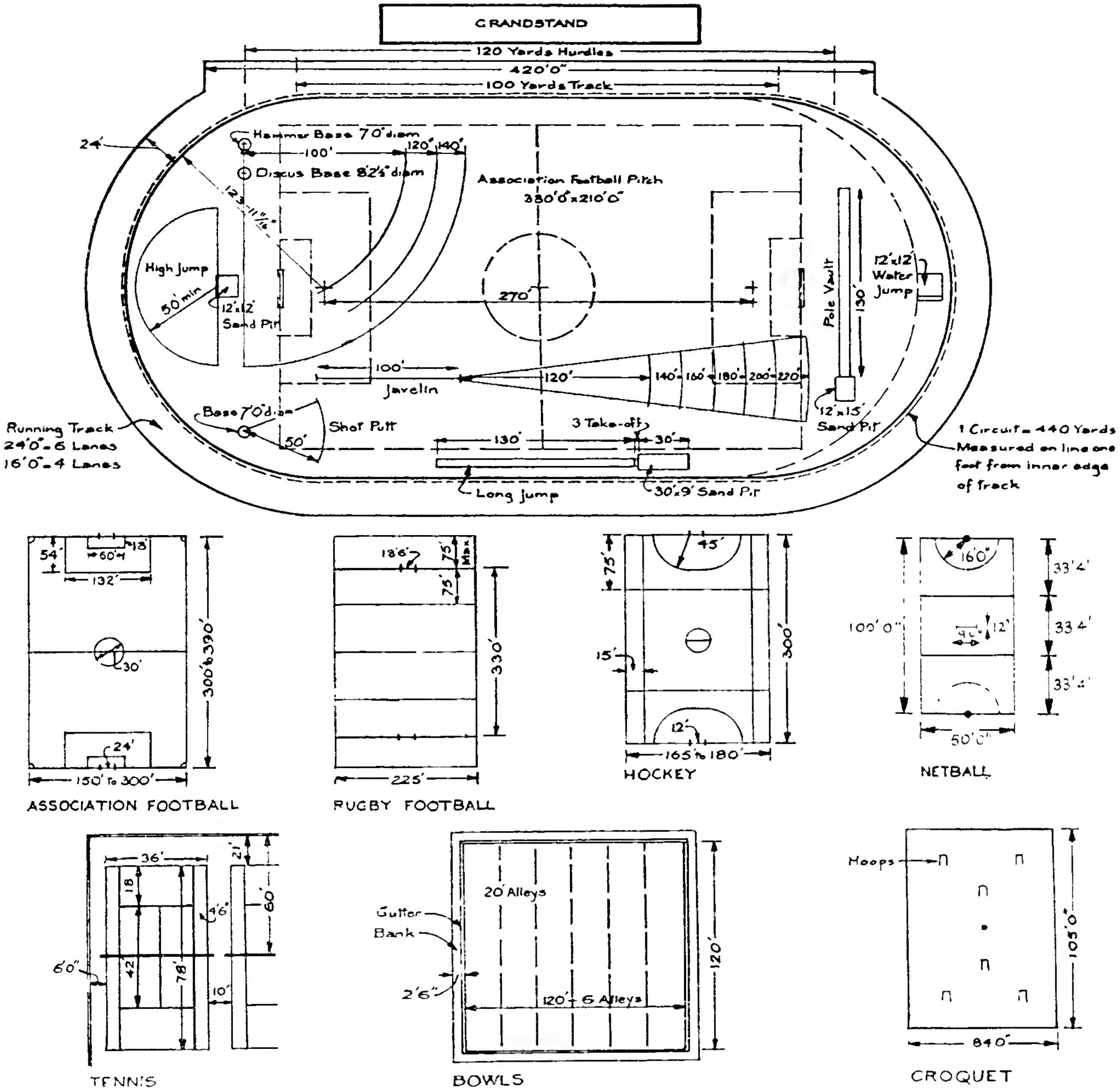



Fig. 4 Layout for a typical athletic ground: playing areas for various games

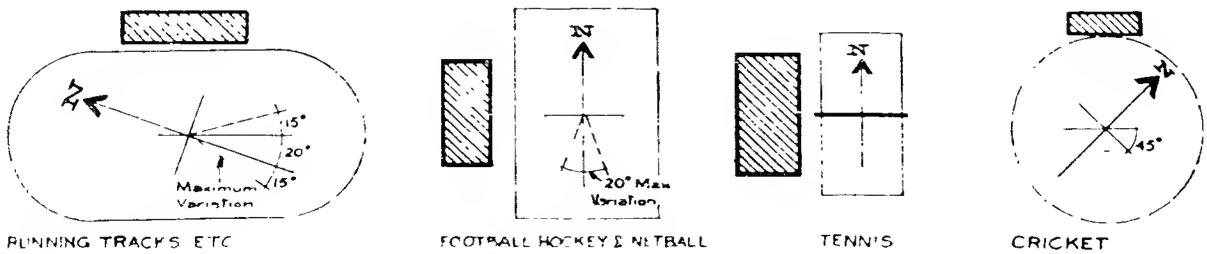



Fig. 5 Aspect diagrams for playing areas

### Badminton

Fig. 6 opposite shows the sizes of badminton courts, which are 44ft. long and 20ft. wide for doubles games: singles courts are 17ft. wide, as shown by the inner lines of the diagram. The game may be played either indoors or in the open air. Outside courts should be sheltered very carefully from the wind, owing to the light weight of the shuttlecock. Floors of outside courts may be wood, asphalt, cement, or a patent polished non-sweating material.

Covered badminton courts require an overall internal size of at least 64ft. long and 32ft. wide and 25ft. high at the centre, which can be slightly diminished towards the ends and sides of the court. As the walls are not used as playing surfaces, they may be of any suitable material, but floors are generally of wood, such as maple, and should be in narrow widths secretly nailed.

Top light is essential, preferably the full width of the court and about one-third of the area of the court, and artificial light is of great importance as courts are often used in the evening.

### Squash Rackets

The figure shows the main dimensions and marking necessary for a squash rackets court; the internal dimensions of the court itself are 32ft. long, 21ft. wide and a minimum height of 15ft. to the play line on the front wall, to which must be added at least 2ft. of clear space. Top light is essential over at least one-third of the floor area. Walls should be of brickwork, which is generally finished internally with patent non-sweating plaster. Floors are usually of polished maple in narrow widths. The entrance doors should be special flush doors with special flush door furniture. It is fairly usual to arrange a spectators' gallery on the back wall, consisting of an opening protected with wire netting, the floor being placed about 8ft. 6in. or 9ft. above the floor of the court over the entrance space. Steeply stepped seating is desirable in order to allow spectators at the back of the gallery the maximum possible view of the floor of the court. Ventilation of the court may be provided by placing fresh-air inlets behind the "tin" on the front playing wall, and a window or extract fan on the wall at the back of the gallery.

Some ventilation can sometimes be arranged in conjunction with the top-lighting, but care should be taken to exclude any possibility of rain entering as the maple floor is easily damaged by moisture.

Artificial lighting is most essential for squash rackets; special consideration should be given to this lighting in order to provide sufficient intensity, together with even distribution over the whole court. Lights should be protected against damage by the use of wire mesh.

When changing rooms are provided to serve the squash rackets courts only, two rooms are desirable, one for each sex, together with shower baths, lavatory and W.C. attached to each changing room.

Doubles-squash courts are now sometimes required. The American standard size for such courts is 45ft. long by 25ft. wide. The height of the play line on the front wall is 20ft. and on the back wall not less than 8ft., and a greater overall height is needed.

### Billiard-rooms

These are large rooms and the floors must carry a considerable load more or less centrally, without any liability to vibration; the most suitable position is on the ground floor. A full-size billiard table measures 12ft. 8in. by 6ft. 8in., and weighs 23cwt, while a common, smaller size of table is 8ft. by 4ft., with a weight of 15cwt. Owing to the length of cues, a clear space 6ft. wide must surround the tables; if two tables are placed side by side, at least 5ft. should be allowed between them. The foundation carrying the table is sometimes separate from the remainder of the room. Any seating or fireplace must be outside the 6ft. area. Seats should be raised on a dais.

A billiard-room is of little value for any purpose other than the game for which it is designed, and may therefore be given an unimportant aspect, such as north or east. It is very difficult to provide adequate and suitable daylight for the table, and it is general to side-light the room and play entirely by artificial light.

Top light causes bad shadows to be cast by the artificial lighting fixtures, which are generally apt to be large and immovable.

### Fives

Two types of court are shown, Rugby and Eton. The walls of the courts should be of non-sweating plaster and the floors should be non-dusting; Eton grey in colour and Rugby fives courts red. The access to Rugby-type court should be flush, with flush door furniture.

### Table Tennis

Tables vary considerably in size, but plans should allow for full-size tables 9ft. by 5ft., with at least 5ft. between tables side by side and 10ft. between end and end, but these spaces may with advantage be increased considerably for match play. Special care should be taken to provide adequate lighting both for day and night play.

### Cards

Card rooms should be planned on a unit as illustrated in Fig. 7. Tables should be 2ft. 6in. or 3ft. square, with at least 1ft. 6in. on all sides for chairs; gangway space between chairs should be at least 2ft. wide and should be increased to at least 3ft. for some of the gangways in the rooms.

### Darts

Darts require a board fixed in a definite position and a cabinet with doors to house the board, either fixed to the wall or incorporated in the panelling. The placing of the darts board must permit of ample space for the necessary 9ft. long "throw", and be such that players cannot cause any danger to others; gangways and doorways should be carefully avoided.

Fig. 7 illustrates a typical dart-board cabinet, together with the more important general dimensions. It is becoming very general to enclose the board in a box with doors which, when opened, provide a blackboard surface for scoring. The centre of the board should not be less than 4ft. from any doorway or gangway space, and preferably rather more for reasons of safety, but it may be placed as near as 2ft. 6in. to a side wall. Proper provision should be made for artificial lighting of the board.

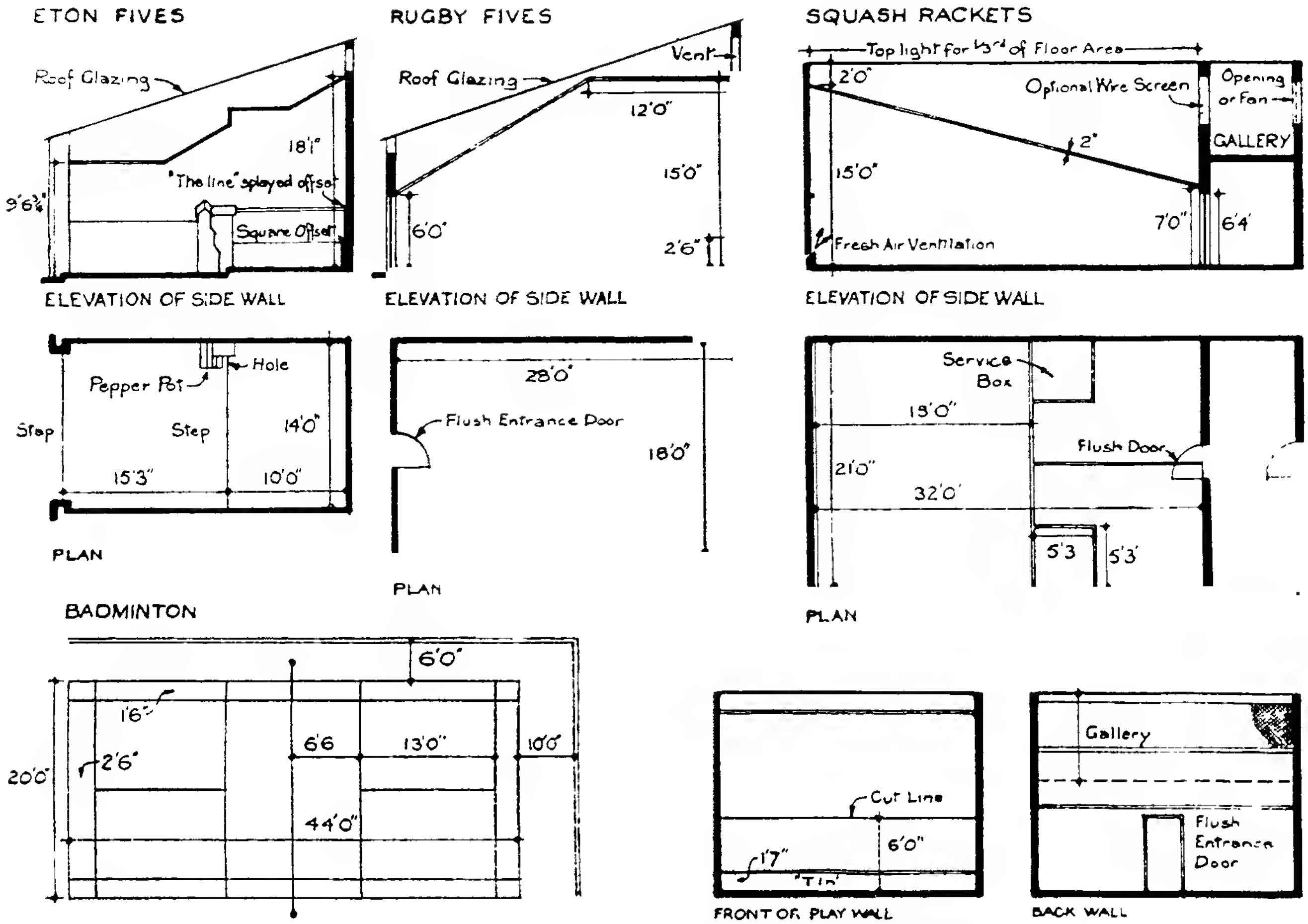



Fig. 6 Layout and dimensions of courts for fives, squash rackets and badminton

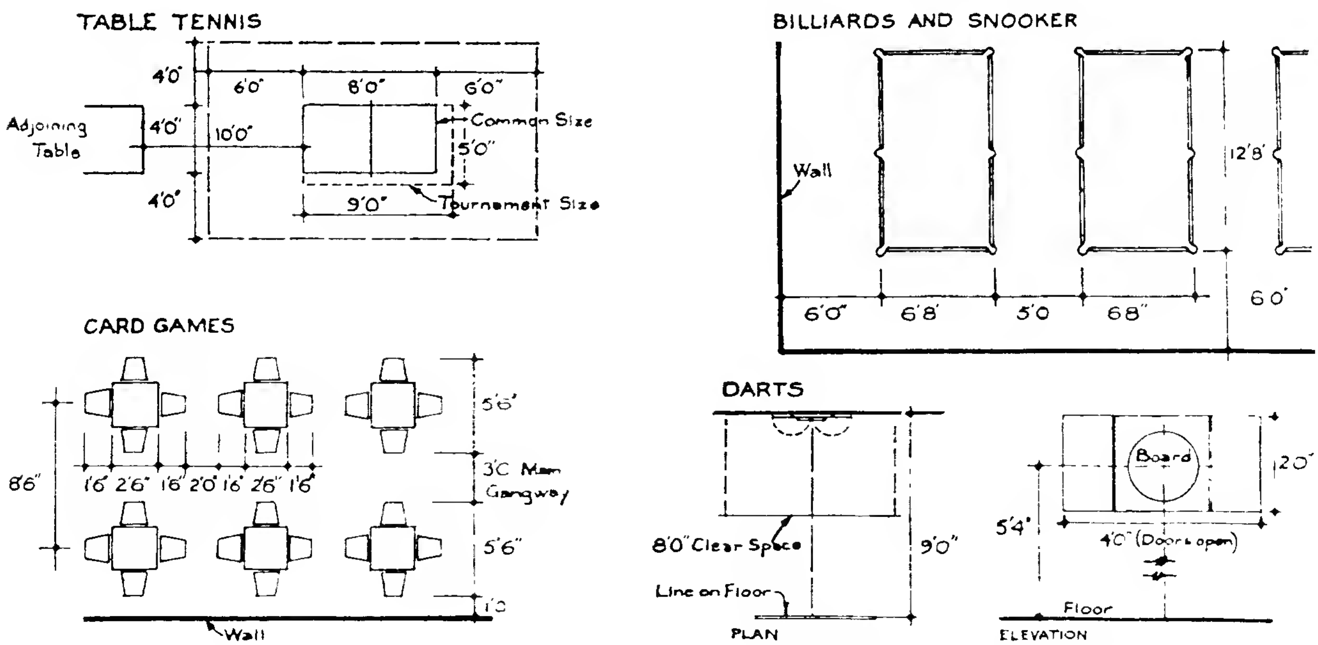



Fig. 7 Details of rooms for various indoor games

# *Circulation*

## STAIRCASES

### General

Planning data is given on this and the adjoining page; for particulars relevant to one particular type of building only, see the relevant section.

### Stairs in Domestic Buildings

Fig. 1 illustrates the minimum requirements for staircases, and also makes clear the spaces which are available for cupboards, and similar purposes both under and over the flight.

Those parts of understair spaces which are less than 4ft. high are of little value, and if not blocked off tend to accumulate undesirable rubbish which seldom gets moved and thus attracts dirt and dampness.

Dimensions for the design of lavatories under stairs are given in the section on " Sanitation ".

If the lower steps of a flight are turned, as shown top right, it is wise to have the balustrading opposite the front door removable, to simplify the transport of furniture up the stairs. This is easily made possible by having removable caps to the newels and sliding the balustrade panel into grooves.

### Stairs in Buildings used by the Public

Stairs for escape should be enclosed with fire-resisting materials having fire cut-off lobbies at each floor; they must be constructed of fire-resisting materials and should have continuous handrails on both sides, except across door openings. Doors opening on to staircases must swing clear of the normal passageway and open outwards from the main floor area. Doorways should be at least 4ft. 6in. wide in the clear, while the doors should be self-closing and be of fire-resisting materials. Staircases should have adequate natural light and be ventilated by windows, which implies that they should be placed on outside walls: a further reason for this placing is to make escape to the open air easy.

The regulations stress the planning of artificial lighting of staircases to ensure that treads are between 25 and 75 per cent in shadow, and that the edges of the treads are easily distinguishable.

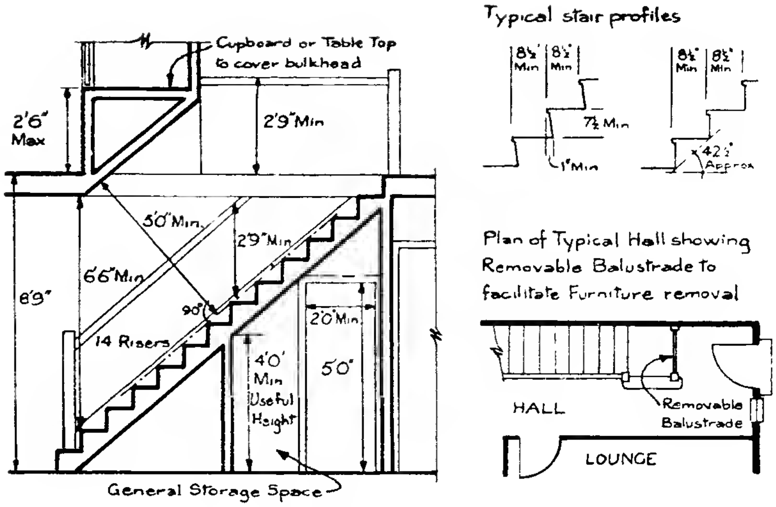



Fig. 1 Key dimensions for staircases in housing

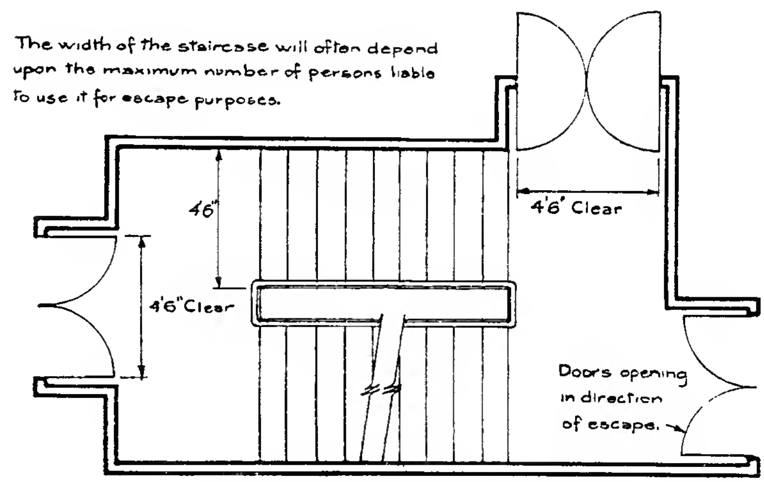



Fig. 2 Typical escape stair with recessed entrances

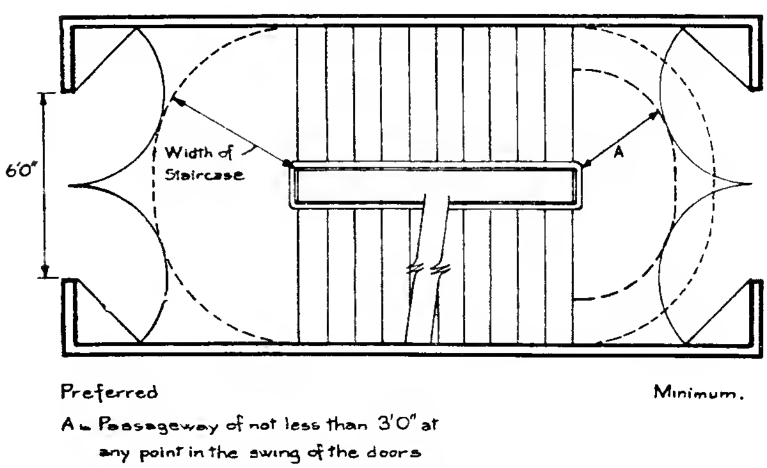



Fig. 3 Typical escape stair without recessed entrances

## NO. OF RISERS AND FLIGHTS, HEIGHTS OF HANDRAILS AND HEAD CLEARANCE, Etc.

| | |
|---|---|
| Minimum No. of risers in a flight .. .. .. .. . .. | 3 |
| Maximum No. of risers in a flight without a landing .. .. .. .. | 16 |
| Maximum No. of risers in a flight, if there is no change between two flights | 12 |
| Maximum No. of flights without a change of direction . .. .. | 2 |
| Minimum height of handrail measured vertically from a line joining the nosings | 2ft. 9in. |
| Minimum height of handrail for external escape stairs .. .. .. | 3ft. 6in. |
| Minimum height of handrail when horizontal .. | 2ft. 9in. housing, 3ft. 0in. public |
| Minimum head clearance measured vertically .. .. .. .. .. | 6ft. 6in. |
| or measured at right angles to a line joining the nosings .. . | 5ft. 0in. |
| Maximum width of stair without a centre handrail .. .. .. .. | 5ft. 6in. |

## RATIO OF RISE TO TREAD

| Rise | Tread |
|---|---|
| in inches | |
| 5 | $12\frac{1}{2}$–$13\frac{1}{2}$ |
| $5\frac{1}{4}$ | 12 –13 |
| $5\frac{1}{2}$ | $11\frac{1}{2}$–$12\frac{1}{2}$ |
| $5\frac{3}{4}$ | 11 –12 |
| 6 | $10\frac{1}{2}$–$11\frac{1}{2}$ |
| $6\frac{1}{4}$ | 10 –11 |
| $6\frac{1}{2}$ | $9\frac{1}{2}$–$10\frac{1}{2}$ |
| $6\frac{3}{4}$ | 9 –10 |
| 7 | $8\frac{1}{2}$– $9\frac{1}{2}$ |
| $7\frac{1}{4}$ | 8 – 9 |
| $7\frac{1}{2}$ | $7\frac{1}{2}$– $8\frac{1}{2}$ |

*One method of estimating the ratio of riser to tread is 2 × rise + tread = $22\frac{1}{2}$in.–$23\frac{1}{2}$in.: the above table is based on this ratio.*

## MINIMUM WIDTHS OF STAIRS, SIZES OF RISERS AND TREADS

| Type of use | Minimum width of stair | Min. width of tread (in.) | Max. height of rise (in.) |
|---|---|---|---|
| Housing .. . | 2ft. 11in. .. .. .. .. | $8\frac{1}{2}$ | $7\frac{1}{2}$ |
| Private houses .. | 3ft. 3in. .. .. .. .. | 9 | 7 |
| Flats, entrance .. | 3ft. 6in. . . .. .. | 9 | 7 |
| Offices .. .. | 3ft. 6in., for 200 persons, 4ft. 6in. for over 200 persons plus 6in. per 100 persons over 400 .. . . | 9 | 7 |
| Schools .. .. | 3ft. 6in., see table below . .. | 10 | $6\frac{1}{2}$ |
| Stores .. .. | 4ft. 6in. allow 12in. per 1,000sq. ft. floor area .. . .. . | 10 | $6\frac{1}{2}$ |
| Municipal—main | 5ft. 0in. .. .. .. | 11 | 6 |
| secondary | 4ft. 0in. .. .. . .. | 9 | 7 |
| Factories .. | 3ft. 6in. .. .. .. .. | 9 | 7 |

- Treads and risers must be each the same size in each and every flight used by the public.
- Winders are not recommended, but where unavoidable, three should occupy a quarter space, or five a half space.
- All landings must be at least the width of the stairway.
- All stairs should have a non-slip finish.
- Continuous handrails are necessary in all buildings.
- Stairs should have natural light and ventilation and adequate artificial lighting at night.

## NUMBER AND WIDTH OF STAIRS IN SCHOOLS

| No. of storeys from ground floor exit doors | 2 Stairways | | | | | 3 Stairways | | | | | 4 or more stairways | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Maximum No. of children on all upper floors | | | | | | | | | | Max. No. of children using a stairway | | | | |
| 2 .. .. .. | 260 | 290 | 330 | 360 | 390 | 470 | 520 | 580 | 640 | 700 | 160 | 180 | 200 | 230 | 260 |
| 3 .. .. . .. | 300 | 340 | 380 | 430 | 480 | 540 | 610 | 690 | 770 | 850 | 190 | 220 | 250 | 280 | 310 |
| 4 .. .. .. .. | 340 | 390 | 440 | 500 | 560 | 610 | 700 | 800 | 900 | 1000 | 220 | 250 | 290 | 330 | 370 |
| 5 .. . .. .. | 390 | 450 | 510 | 580 | 650 | 690 | 800 | 910 | 1030 | 1150 | 250 | 290 | 330 | 380 | 420 |
| 6 .. .. . .. | 430 | 500 | 570 | 650 | 730 | 760 | 890 | 1020 | 1160 | 1300 | 280 | 330 | 380 | 430 | 480 |
| 7 .. .. | 470 | 550 | 630 | 720 | 810 | 840 | 990 | 1140 | 1300 | 1450 | 310 | 360 | 420 | 480 | 530 |
| 8 .. .. .. .. | 510 | 600 | 690 | 790 | 890 | 920 | 1090 | 1260 | 1430 | 1600 | 340 | 400 | 460 | 530 | 580 |
| 9 .. .. .. .. | 550 | 650 | 750 | 860 | 970 | 1000 | 1180 | 1370 | 1560 | 1740 | 370 | 430 | 500 | 570 | 640 |
| 10 . .. .. .. | 600 | 710 | 820 | 940 | 1060 | 1070 | 1270 | 1480 | 1690 | 1890 | 400 | 470 | 540 | 620 | 700 |
| Min. width of each stair .. | 3′ 6″ | 4′ 0″ | 4′ 6″ | 5′ 0″ | 5′ 6″ | 3′ 6″ | 4′ 0″ | 4′ 6″ | 5′ 0″ | 5′ 6″ | 3′ 6″ | 4′ 0″ | 4′ 6″ | 5′ 0″ | 5′ 6″ |

## LIFTS

### Passenger Lifts

The number, speed and size of lifts is dependent on the type of building in which they are to be installed, as is shown below.

*Positioning.*—Lifts should be grouped together, wherever possible, in order to make the maximum use of lift wells and machine rooms. Only in exceptional circumstances should the machine room be placed anywhere but immediately above the lift well. This position usually reduces loading on the structure, is less in first costs, allows a smaller lift well for a given size of car and reduces maintenance costs, mainly in regard to suspension rope wear and shorter lengths of ropes.

*Sound Transmission.*—The lift wells should not back on to adjoining walls of rooms in which people have to live or work. Everything possible should be done to reduce sound transmission from halls and lobbies: in addition, great care should be taken to insulate the lift machinery at source.

*Lighting.*—Every lift-car should be adequately illuminated.

*Fire Protection.*—As with staircases, lifts generally have to be enclosed for their full height with fire-resisting materials and have fire-resisting doors or fire-shutters; the lift well should be carried up, if possible, above the roof and be vented to the open air through a louvred smoke vent. Machine rooms should be permanently ventilated by means of high-level air outlets and low-level air intakes and, if possible, should have natural lighting without the necessity of leaving open access doors to roofs when repairs or maintenance work are being carried out.

### Lifts in Flats

These are essential in all flats over three storeys high.

*Number of Lifts.*—Whenever possible, a minimum of two lifts should be installed: this is particularly important above eight floors: it allows for the continued operation of one of the lifts, while the other is being inspected or repaired. Some economy, however, can be made if the lifts only stop at alternate floors. It is preferable to use small lifts with a capacity of up to eight persons.

*Control.*—All lifts should have automatic push-button control, with self-closing doors. But if there are more than eight floors, collective control systems may be necessary.

*Entrances.*—Doors should be flush with a small vision panel, and access should be on one side of the lift only.

*Prams.*—Where only one lift is provided, this should be large enough to take a pram or large pieces of furniture. If two lifts are used, one of them should be this size: this lift should stop at all floors although the other might only stop at alternate floors.

### Lifts in Hotels

One lift may be enough for a small hotel but in larger hotels specialist advice should be sought to determine the number of lifts for passengers, luggage, goods and for kitchen and restaurant.

*Control.*—In small hotels push-button control is suitable but for all others, collective systems should be used so that the lifts may be driven by attendants when required. Indicators should be provided at each floor to show the position of the lift.

*Entrances.*—Doors should be flush with a small vision panel. The entrance should be set back from the main circulation to allow a space of from 3ft. to 4ft. clear in front of the lift.

### Lifts in Offices

In small buildings one push-button lift may be enough but in all other cases specialist advice should be sought. It is necessary to establish the number and duty of lifts with reference to the population of the building, number of floors, its occupation and position.

*Control.*—In all large buildings grouping of lifts is necessary, with a number of cars operating as a unit with grouped control.

*Entrances.* — Centre-opening flush doors should be provided, allowing room for waiting passengers in addition to normal circulation.

### Lifts in Stores

These should always be provided if the store is over two storeys high.

*Number of Lifts.*—Several lifts, for between 12 and 20 persons, at well-controlled time intervals provide the most efficient service. Sometimes lifts are specially allocated to serve one room, such as a restaurant. In some large stores, the lifts are divided into two batteries, one serving only upwards and one downwards, to avoid confusion. A lobby arrangement with the " up " service on one side and the " down " on the other is then most convenient.

*Control.*—Store lifts are normally operated by an attendant.

*Entrances.*—Doors should be flush, with a small vision panel, and with maximum clear entrance.

*TO CALCULATE THE APPROXIMATE NUMBER AND SIZE OF LIFTS*

Calculation should be based on total estimated population, the desired waiting interval (from 20 to 60 seconds according to the type of building and its importance), the number of upper floors and any special services which may be needed. Specialist advice should be sought as the calculations are extremely complex.

### Number of Persons in a Given Type of Building

Offices: General offices, one person per 60sq. ft.; private offices, one person per 80sq. ft.

Hotels: one person per 100–150sq. ft.

Flats: one person per 250sq. ft.

Department stores, peak load: one person per 25sq. ft.

### Normal Speeds for Lifts in a Given Type of Building

Flats:

- Low- or medium-rent, up to eight floors—100ft. per minute.
- More than eight floors—150–300ft. per minute.

Offices:

- Up to 5 floors—100ft. per minute.
- Up to 8 floors—150–200ft. per minute.
- Up to 20 floors—300–500ft. per minute.
- More than 20 floors—500–800ft. per minute.

Small stores—150ft. per minute.

Department stores — 300–500ft. per minute.

Hospitals (for bed lifts) 100–200ft. per minute (higher speeds are being considered for multi-storey hospitals).

### Allowance for Passengers Entering the Lift

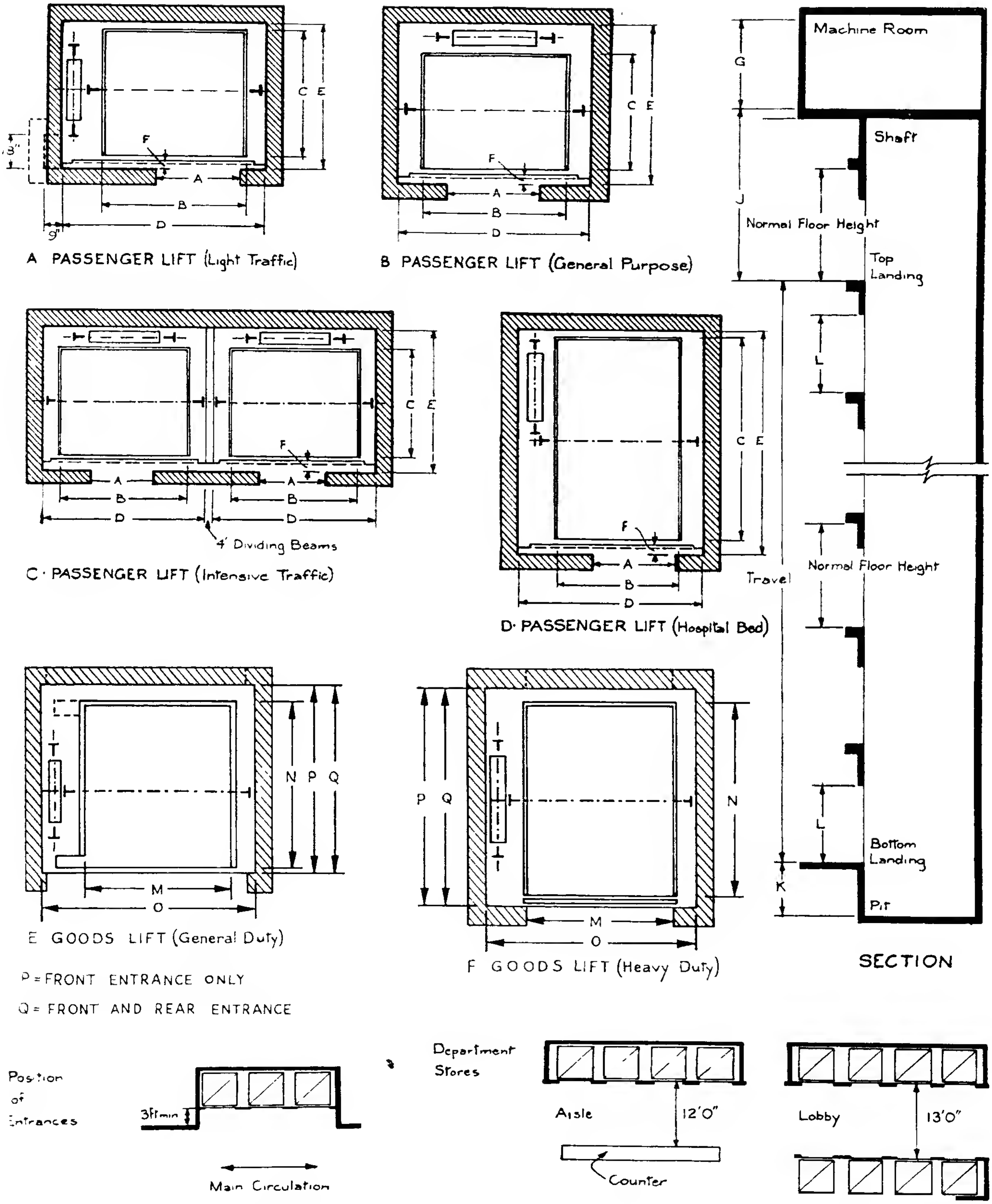
One passenger to enter a lift—2sec.

Allowance at each landing—8sec.

Allowance at ground, or major floor—20sec.

For calculations it is normal to expect a time interval between trips of 30sec. and two-thirds the number of persons per floor.

The length of travel is shown in Fig. 4, the speed and capacity of lifts is shown in the tables on page 30, and page 31.




*Note :* dimensions relevant to these diagrams are given on pages immediately following

Fig. 4 Types and positions of lifts for various buildings

## PASSENGER LIFT DATA

### PASSENGER LIFTS

| Type of use | No. of persons | Load | Type of lift | Speed | Entrance: No. of panels | Entrance: A | Platform: B | Platform: C | Lift well: D | Lift well: E | Sill: F | Machine room: G | Machine room: H | Heights: J | Heights: K | Heights: L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | lb. | | ft./min. | | ft. in. | ft. in. | ft. in. | ft. in. | ft. in. | in. | ft. in. | sq ft. | ft. in. | ft. in. | ft. in. |
| Flats and small offices | 4 | 600 | A | 100 | single sliding | 2 3 | 3 8 | 3 1 | 5 8 | 3 10 | 5 | 7 0 | 75 | 13 6 | 3 3 | 6 8 |
| | 6 | 900 | A | 100 | single sliding | 2 6 | 4 2 | 3 8 | 6 3 | 4 5 | 5 | 7 0 | 75 | 13 6 | 3 3 | 6 8 |
| | 8 | 1200 | A | 100 | single sliding | 2 9 | 4 8 | 4 1 | 6 9 | 4 10 | 5 | 7 0 | 75 | 13 6 | 3 3 | 6 8 |
| | | | | 150 | | | | | | | | | | 14 0 | 3 9 | 6 8 |
| Prams | | | A | 100 | single sliding | 2 9 | 3 9 | 5 2 | 6 0 | 6 0 | 5 | 7 0 | 75 | 13 6 | 3 3 | 6 8 |
| General purpose | | | B | 200 | double, side opening | 3 0 | 5 0 | 4 0 | 6 4 | 5 10 | 6½ | 7 6 | 130 | 14 9 | 5 0 | 7 0 |
| | 10 | 1500 | B | 150 | double, centre opening | 3 0 | 6 0 | 4 0 | 7 4 | 5 8 | 5 | 7 6 | 130 | 14 9 | 4 0 | 7 0 |
| | | | | 200 | | | | | | | | | | 14 9 | 5 0 | 7 0 |
| | | | | 300 | | | | | | | | | | 15 0 | 5 0 | 7 0 |
| Offices and hotels | | | C | 350 | double, centre opening | 3 0 | 6 0 | 4 0 | 7 4 | 5 10 | 5 | 8 6 | 320 | 18 0 | 8 3 | 7 0 |
| General purpose | 13 | 2000 | B | 150 | double, centre opening | 3 0 | 6 4 | 4 5 | 7 8 | 6 1 | 5 | 7 6 | 130 | 14 9 | 4 0 | 7 0 |
| | | | | 200 | | | | | | | | | 130 | 14 9 | 5 0 | 7 0 |
| | | | | 300 | | | | | | | | | 140 | 15 0 | 5 3 | 7 0 |
| Offices and hotels | | | C | 350 | double, centre opening | 3 0 | 6 4 | 4 5 | 7 8 | 6 3 | 5 | 8 6 | 360 | 18 0 | 8 3 | 7 0 |
| General purpose | 16 | 2500 | B | 150 | double, centre opening | 3 6 | 7 0 | 5 0 | 8 4 | 6 8 | 5 | 7 6 | 130 | 14 9 | 4 0 | 7 0 |
| | | | | 200 | | | | | | | | | 130 | 14 9 | 5 3 | 7 0 |
| | | | | 300 | | | | | | | | | 140 | 15 0 | 5 3 | 7 0 |
| Offices and hotels | | | C | 350 | double, centre opening | 3 6 | 7 0 | 5 0 | 8 4 | 6 10 | 5 | 8 6 | 400 | 18 0 | 8 3 | 7 0 |
| | | | | 500 | | | | | | | | | | 19 0 | 9 3 | 7 0 |
| General purpose | 20 | 3000 | B | 150 | double, centre opening | 3 6 | 7 0 | 5 6 | 8 4 | 7 2 | 5 | 7 6 | 130 | 14 9 | 4 3 | 7 0 |
| | | | | 200 | | | | | | | | | 130 | 14 9 | 5 3 | 7 0 |
| | | | | 300 | | | | | | | | | 185 | 15 9 | 5 3 | 7 0 |
| Offices and hotels | | | C | 350 | double, centre opening | 3 6 | 7 0 | 5 6 | 8 4 | 7 4 | 5 | 8 6 | 440 | 18 0 | 8 3 | 7 0 |
| | | | | 500 | | | | | | | | | | 19 0 | 9 3 | 7 0 |
| | 23 | 3500 | C | 350 | double, centre opening | 3 6 | 7 0 | 6 2 | 8 4 | 8 0 | 5 | 8 6 | 470 | 18 0 | 8 3 | 7 0 |
| | | | | 500 | | | | | | | | | | 19 0 | 9 3 | 7 0 |
| Department stores, concert halls | | | C | 350 | four, centre opening | 5 0 | 8 0 | 5 6 | 9 4 | 7 6 | 6½ | 8 6 | 470 | 18 0 | 8 3 | 7 0 |
| | | | | 500 | | | | | | | | | | 19 0 | 9 3 | 7 0 |
| | 26 | 4000 | C | 350 | four, centre opening | 5 0 | 8 0 | 6 0 | 9 5 | 8 0 | 6½ | 8 6 | 480 | 18 0 | 8 3 | 7 0 |
| | | | | 500 | | | | | | | | | | 19 0 | 9 3 | 7 0 |
| | 33 | 5000 | C | 350 | four, centre opening | 6 0 | 9 0 | 6 0 | 10 5 | 8 0 | 6½ | 8 6 | 520 | 18 0 | 8 3 | 7 0 |

The information tabulated above and on the opposite page is intended as a guide to the capacity of the various types of passenger lift and as a guide to the main dimensions required for planning purposes. Dimensions may vary slightly.

*Note :* the dimensions given in this table and in the tables on page 31 refer to the diagrams on page 29

## HOSPITAL BED LIFTS

| Type of use | No. of persons | Load | Type of lift | Speed | Entrance | Entrance | Platform | Platform | Lift well | Lift well | Sill | Machine room | Machine room | Heights | Heights | Heights |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | No. of panels | A | B | C | D | E | F | G | H | J | K | L |
| | | lb. | | ft./min. | | ft. in. | ft. in. | ft. in. | ft. in. | ft. in. | in. | ft. in. | sq. ft. | ft. in. | ft. in. | ft. in. |
| Hospital bed passenger | 23 | 3500 | D | 100 | two, side opening | 3 10 | 5 4 | 8 4 | 7 5 | 9 3 | 6½ | 7 0 | 130 | 14 6 | 4 0 | 7 0 |
| | | | | 150 | | | | | | | | | | 15 6 | 4 6 | 7 0 |
| | | | | 200 | | | | | | | | | | 16 0 | 5 3 | 7 0 |
| | 27 | 4000 | D | 100 | two, side opening | 4 0 | 5 8 | 8 8 | 7 9 | 9 7 | 6½ | 7 0 | 130 | 14 6 | 4 0 | 7 0 |
| | | | | 150 | | | | | | | | | | 15 6 | 4 6 | 7 0 |
| | | | | 200 | | | | | | | | | | 16 0 | 5 3 | 7 0 |
| | 30 | 4500 | D | 100 | two, side opening | 4 3 | 5 10 | 9 4 | 8 1 | 10 3 | 6½ | 7 0 | 140 | 15 6 | 4 3 | 7 0 |
| | | | | 150 | | | | | | | | | | 16 6 | 5 0 | 7 0 |
| | | | | 200 | | | | | | | | | | 17 0 | 5 6 | 7 0 |

## GOODS LIFTS

| Type of use | Load (alternatives) | | | Type of lift | Speed | Platform | Platform | Lift well | Lift well | Lift well | Machine room | Machine room | Heights | Heights | Heights |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | M | N | O | P[a] | Q[b] | G | H | J | K | L |
| | ton | cwt. | lb. | | ft./min. | ft. in. | ft. in. | ft. in. | ft. in. | ft. in. | ft. in. | sq. ft. | ft. in. | ft. in. | ft. in. |
| General Duty | | 10 | 1200 | E | 50–75 | 4 0 | 4 0 | 6 4 | 4 11 | 5 1 | 7 0 | 80 | 13 9 | 3 0 | 6 6 |
| | | | | | 100 | | | | | | | | 13 9 | 3 3 | 6 6 |
| | | 15 | 1600 | E | 50–75 | 4 6 | 5 0 | 6 10 | 5 11 | 6 1 | 7 0 | 100 | 14 0 | 3 3 | 7 0 |
| | | | | | 100 | | | | | | | | 14 0 | 4 0 | 7 0 |
| | | 20 | 2000 | E | 50–75 –100 | 5 3 | 6 0 | 7 6 | 6 11 | 7 1 | 7 0 | 120 | 14 0 | 4 0 | 7 0 |
| | | | 2500 | | 150 | | | | | | | | 14 6 | 4 6 | 7 0 |
| | | 25 | 3000 | E | 50–75 –100 | 6 0 | 7 6 | 8 5 | 8 5 | 8 7 | 8 0 | 130 | 14 9 | 4 3 | 7 6 |
| | | 30 | 3500 | | 150 | | | | | | | | 15 3 | 5 0 | 7 6 |
| | | 35 | 4000 | E | 50–75 –100 | 7 0 | 8 6 | 9 8 | 9 5 | 9 7 | 8 6 | 140 | 16 0 | 4 6 | 7 6 |
| | | 40 | 4500 | | 150 | | | | | | | | 16 6 | 5 3 | 7 6 |
| Heavy Duty | | 25 | 3000 | F | 50–75 –100 | 6 0 | 7 6 | 8 10 | 8 10 | 9 5 | 8 6 | 130 | 16 6 | 4 6 | 7 6 |
| | | 30 | 3500 | | 150 | | | | | | | | 16 6 | 4 8 | 7 6 |
| | | 35 | 4000 | F | 50–75 –100 | 7 0 | 8 6 | 9 10 | 9 10 | 10 5 | 8 6 | 140 | 16 6 | 4 6 | 7 6 |
| min. floor height 12ft. 0in., without special pass doors | | 40 | 4500 | | 150 | | | | | | | | 16 6 | 5 1 | 7 6 |
| | | 50 | 5000 | F | 50–75 –100 | 7 0 | 10 0 | 10 0 | 11 4 | 11 11 | 8 6 | 150 | 16 6 | 4 8 | 7 6 |
| | | | 5500 | | 150 | | | | | | | | 16 6 | 5 4 | 7 6 |
| | 3 | | 6000 | F | 50–75 100 | 8 0 | 11 0 | 11 0 | 12 4 | 12 11 | 8 6 | 160 | 16 6 | 4 8 | 7 6 |
| | | | 7000 | | 150 | | | | | | | | 16 6 | 5 4 | 7 6 |
| min floor height 12ft. 9in., without special pass doors | 4 | | 8000 9000 | F | 50–75 100 | 8 0 | 14 0 | 11 0 | 15 4 | 15 11 | 8 6 | 180 | 17 6 | 5 4 | 8 0 |
| | 5 | | 10000 11000 | F | 50–75 100 | 10 0 | 14 0 | 13 2 | 15 4 | 15 11 | 8 6 | 200 | 17 6 | 5 4 | 8 0 |

[a] Front entrance only [b] Front and rear entrance lift.

# *Circulation*



## ESCALATORS

### General

Escalators may be used in any building where there is a continuous heavy traffic flow, such as department stores, exhibition halls, race courses, holiday camps, stations, office buildings, airports and open streets. Escalators are particularly useful in office buildings where the hall floor is at a different level from the street.

New manufacturing techniques allow escalators to be made in a complete factory-tested unit and it is usually possible to deliver the machine complete, saving time and expense in site erection and building attendance. To take advantage of this method the site preparation should be completed in advance and an opening of about 11ft. sq. left for access into the building, installation being usually carried out at night.

*Speed.*—The normal speed is 90–100ft. per minute.

*Angle of incline.*—30° and 35° angle escalators are available. The 35° type is not considered suitable for rises of over 20ft.

*Widths.*—Nominal widths are: 2ft., 3ft. and 4ft. The 2ft. width is seldom used nowadays, while the 4ft. is only necessary for highest traffic density.

### Sound Transmission

Well-designed escalators need not involve much noise but wherever possible every precaution should be taken to insulate the sound, more especially by lining the casings with sound-absorbing materials.

### Fire Protection

Where fire regulations limit the cubic capacity of any section of a building to 250,000cu. ft., the escalators, being open from floor to floor, must be enclosed within fire-proof construction, cutting off the escalator circulation from the remainder of the building at each floor, similar to the methods adopted for staircases.

Fig. 6 illustrates a typical section through an escalator and the amount of space required for the installation. The important design factor is the point of intersection of the plane of the steps and the floor levels, on which the whole setting-out on the part of the engineers is based. The motors are generally placed on the top of each flight, but the amount of space, occupied below the floor level with usual floor heights, permits of placing showcases or counters beneath.

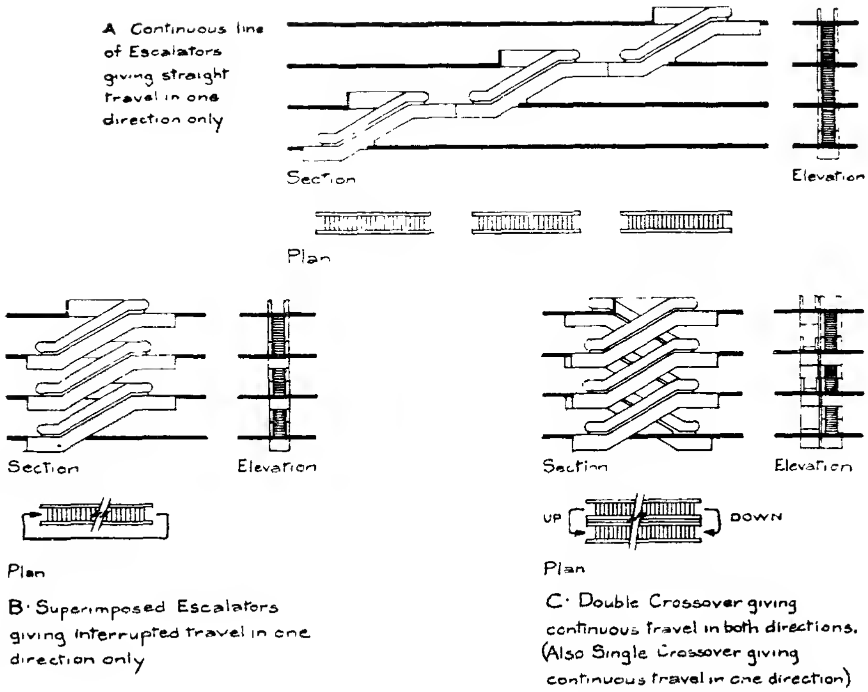
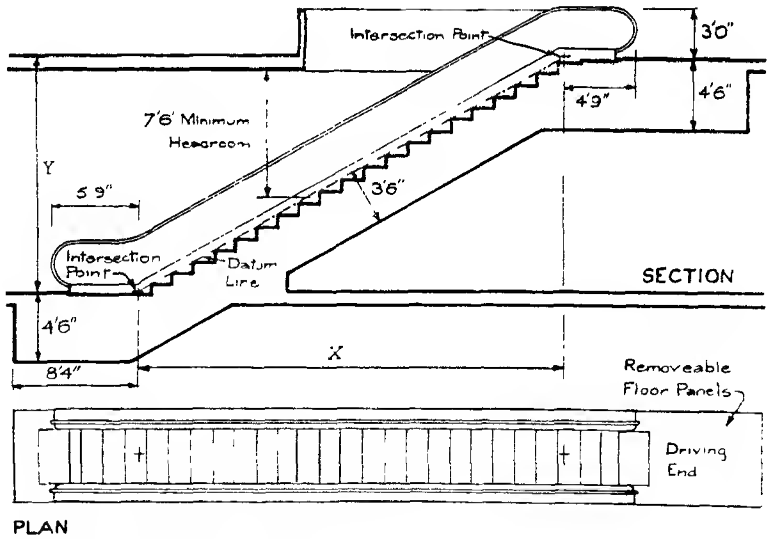



Fig. 5 Types of escalators




With a 30° Escalator $X = 1.732\ Y$
With a 35° Escalator $X = 1.4281\ Y$

| | | | |
|---|---|---|---|
| Nominal width of escalator | 2'0 | 3'0" | 4'0" |
| Clear width over tread | 1 6 | 2 6' | 3 6" |
| Overall width | 4'7" | 5 5" | 6'3" |
| Width between handrails | 2 6" | 3'4" | 4'2" |
| Width inside machine casing | 4 6' | 5 4" | 6'2" |

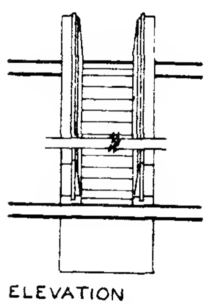



Fig. 6 Typical escalator: space required for installation

### Lavatory Basins

The sizes and types of lavatory basins are innumerable and therefore in this section it is proposed to deal with those of average size only and of a few types.

Where possible, separate basins are preferred as only in this way can really adequate elbow room be given to each user; single basins should be placed 6in. apart to allow for this and for cleaning. Lavatory basins fixed in corners do not normally allow this minimum elbow space.

Basins in ranges should be slightly wider than for single units, to allow all the basins to be used at one time: ranges of basins need an allowance of 1in. in front for overlaps. For economy of space troughs are the most efficient: these are mainly used in factories and are obtainable in narrow widths and in lengths suitable for three or more persons. There is also a circular trough with a central fitting incorporating several liquid or other soap fittings and water supply is carried overhead and dropped to each fitting: this is very economical of floor area as many persons can use one large trough at the same time.

The plumbing for a series of single basins or a range is usually similar and may be arranged in various ways; if the waste discharge is into an open channel no traps are needed, but for all other methods each basin must be trapped. The plumbing may be visible under the basins, or may be enclosed in various ways with panels, pedestals, etc., or the plumbing may be taken into a pipe duct behind the wall against which the basins are placed. If basins are not fixed against return walls and service pipes and wastes are to be cased-in, the shape of the basin-end should be carefully chosen, as it is difficult to make a neat finish of the return of the pipe casing with many types of rounded basin.

Water is supplied by hand-controlled taps to most lavatory basins, but where extreme cleanliness is important foot-pedal control or control from a central point is advantageous.

### Drinking Fountains

It is important when choosing drinking fountains to ensure that the lips cannot touch the nozzle and that the waste water level is at no time higher than the nozzle.

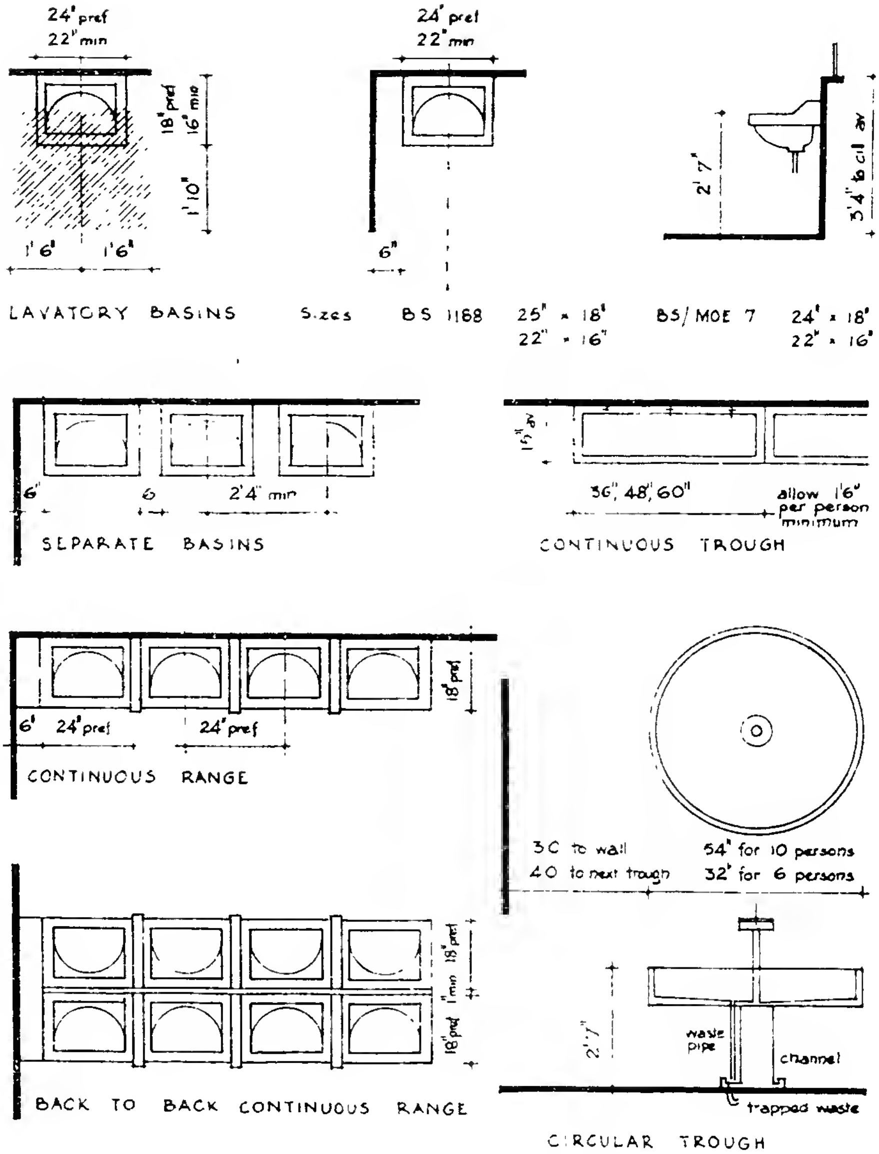



Fig. 1 Types, dimensions and arrangement of lavatory basins

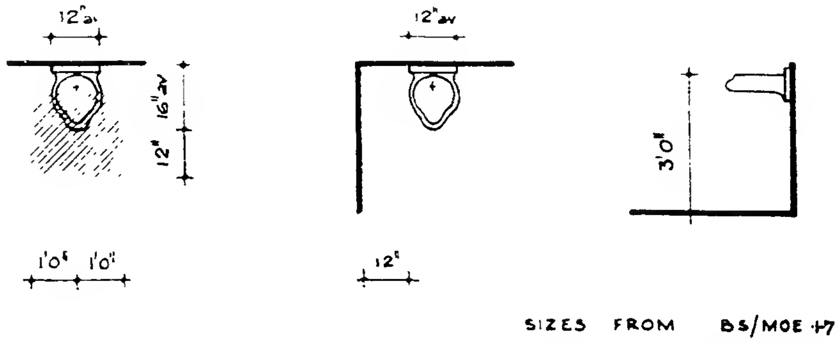



Fig. 2 Dimensions of drinking fountains

FITTINGS

### Sinks

The sizes of sinks vary considerably, the sizes shown are those in most common use. Sinks are mainly made in one of three finishes, fireclay, enamelled metal or sheet or cast iron or stainless steel. Units are available with separate sinks, sinks with draining boards with double draining boards or draining board and work tops. Double sinks with draining boards can also be obtained. Large areas are required for stacking both dirty and washed crockery and it is essential that either a double draining board or a draining board on one side and a work top on the other side of the sink are provided. 1ft. 9in. is the minimum reasonable length for a draining board. Whilst it is not essential for the work top to be made in one piece with a sink, it is a great asset for the sink and draining board to be made in one process as this avoids the dirt trap which normally results when the two units are assembled separately.

Good lighting is essential for working at any sink; this applies equally to both natural and artificial light; care should be taken that the person working at the sink does not have to stand in her own light. Many housewives like to be able to look out of a window whilst working: if a window is provided over the sink, a minimum of 6in. should be allowed between the top of the sink and the window where curtains are to be used, which would otherwise be continually splashed.

Cleaners' sinks are available in fireclay with hardwood pads on the front and metal grilles to avoid chipping the glaze when buckets are filled. In any sink where buckets are to be filled, taps must be placed at least 16in. above the bottom of the sink or grille.

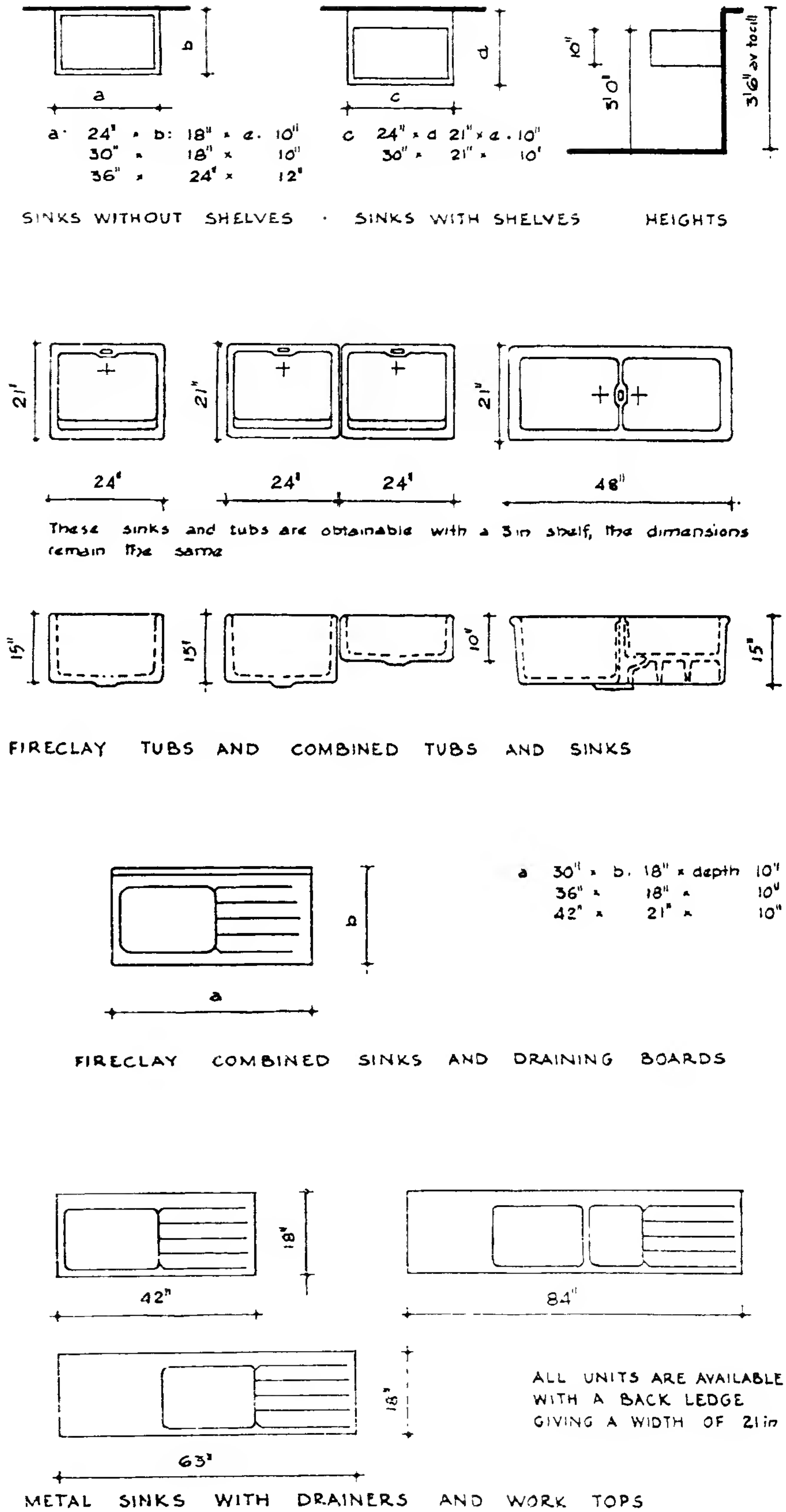



Fig. 3 Types and sizes of sinks and draining boards

### Urinals

As with lavatory basins, there are very many types of urinals, varying from the simple slate slab to very elaborate fireclay fittings The type in most general use is the unit stall, which may be placed in long ranges against a wall or partition; it is general to have a trap and separate flushing cistern to every six stalls.

Urinals often present installation problems where suspended floors with exposed ceilings are used, owing to the thickness required for the channel and the trap which may amount to as much as 14in. from the tread to the underside of the trap. The channel requires a slight fall (⅛in. per foot run) to the outlet. Outlets should serve not more than six stalls. Where floor thicknesses will not contain the channel and trap and the latter cannot be exposed below the ceiling of the floor under, a step is formed in the lavatory compartment. Such foot steps should not be more than 7in. high nor should they be less than 4in.; steps should be at least 12in. wide and fall towards the channel and be so coloured that the difference in level is obvious. Where steps are not required the floor of the room should be drained into the channel.

It is advantageous to provide an access screw-cap at the base of the trap and flush with the ceiling below, and this provision usually dictates the height of any necessary step.

Urinals placed against window walls in front of the windows are not generally liked and may often involve difficulties in placing the flushing cistern and flushing pipes, the former having to be placed at one side of the window opening. Above the actual height of the urinal fitting it is necessary to have sufficient space between the fitting itself and the window-sill for the flushing pipe and its necessary falls, for which at least 6in. should be allowed, although this is dependent on the number of stalls which have to be flushed from one tank placed at the side of the window. The window-sill height is also dependent on the position of the drainage in relation to the normal floor of the room.

### Bidets

The use of bidets is tending to increase in this country, but the local water authority should be consulted when considering an installation.

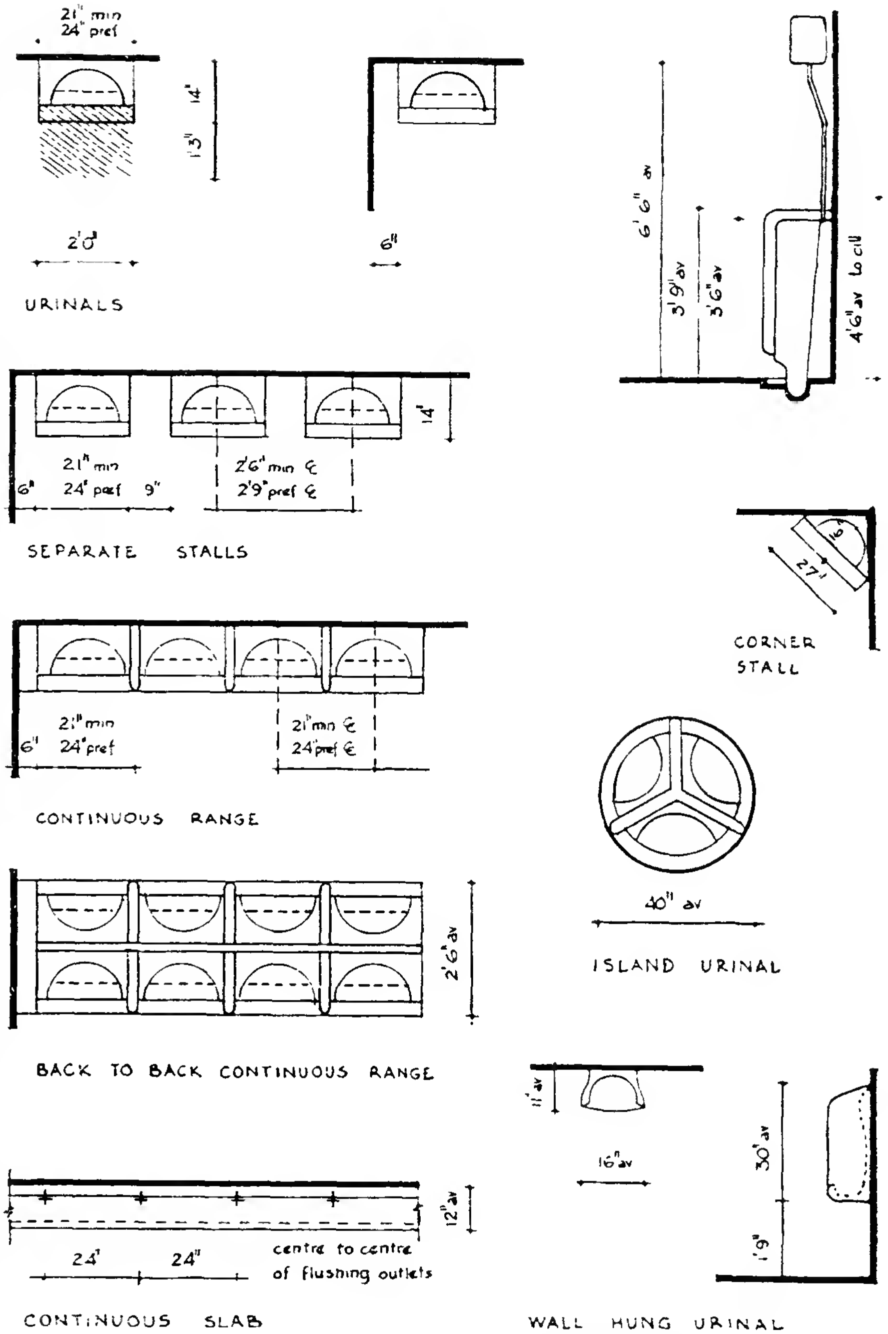



Fig. 4 Types, dimensions and arrangement of urinals

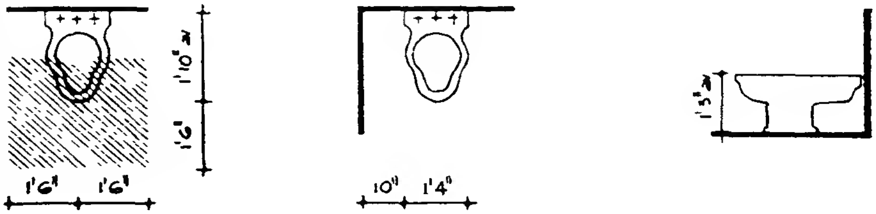


Fig. 5 Dimensions of bidets

## FITTINGS

### Water Closets

The sizes required for W.C. compartments are based on fittings of average sizes for use by adults: the dimensions of fittings may vary considerably. A width of 2ft. 6in. should be considered to be the absolute minimum, but for average-class buildings 2ft. 9in. should be taken as a minimum. The absolute minimum length should not be less than 4ft. 6in., but this necessitates the use of a door 2ft. 3in. wide and leaves very little clearance between the door and the seat and very little space in which to stand while opening the door. For average planning the minimum length of the compartment should be taken as 5ft. and doors should be 2ft. 4in. wide.

Fig. 6 illustrates effects of placing flushing cisterns in varying positions and the lengths of the fittings from the wall faces to the front edges of the fittings. It shows the W.C. with an overhead water-waste preventer connected together with the normal flush pipe on the wall face; incidentally, both the water-waste preventer and the flush pipe have to be placed on a side wall when windows are used in each W.C. compartment on the back wall, whereas the low-down cistern types may have windows over them and are consequently generally tidier in appearance.

It also shows the space occupied by a W.C. with a low-level type of water-waste preventer; the latter varies a little in height and placing above the seat, which affects the overall length of a compartment a little. The low-cistern suite is about 5in. to 6in. longer overall from the back wall, which necessitates a similar increase in the overall length of compartments.

Fig. 6 also shows the placing of the water-waste preventer at a high level and outside the compartment and within a pipe duct behind the wall or partition, against which the W.C. fitting is placed; this method overcomes unsightliness of flushing cisterns and pipes and is again improved if continuous trough flushing-cisterns are used to serve a range of W.C.s. The placing of the flushing tanks in the ducts also assists in the reduction of noise.

The use of a "P" trap, as against an "S" trap, if the outlet is taken straight through the wall enables the W.C. to be placed closer to the wall.

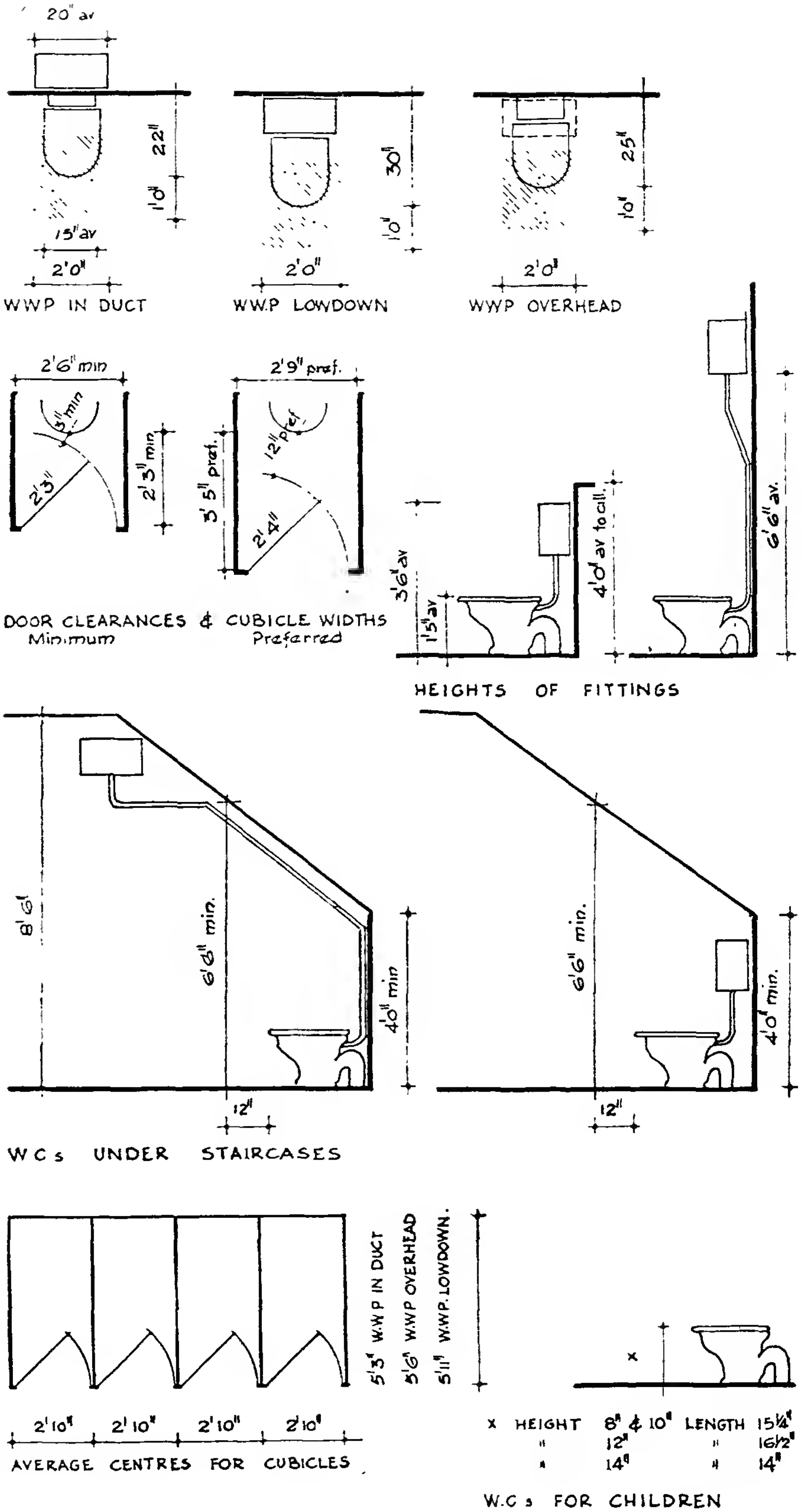



**Fig. 6** Dimensions and placing of water closets and W.C. compartments

### Baths

Two sizes of bath are in common use, one 5ft. 6in. long and the other 6ft. 0in. long; the width of both baths is 2ft. 4in. The height of baths, however, varies according to the type of trap used.

The most comfortable height for a bath is achieved when the bottom of the bath is placed level with the floor of the room. This normally complicates plumbing details within the floor and is therefore seldom possible to arrange.

If the bath is to be enclosed it is essential that bath panels should be readily removable for access to the plumbing.

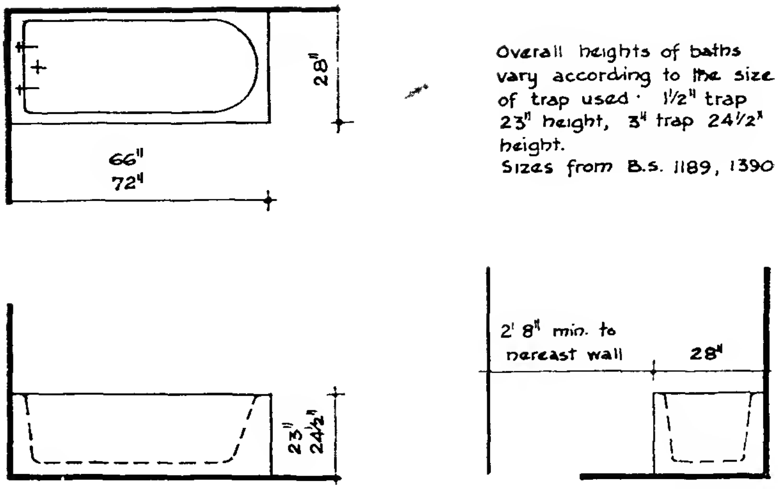
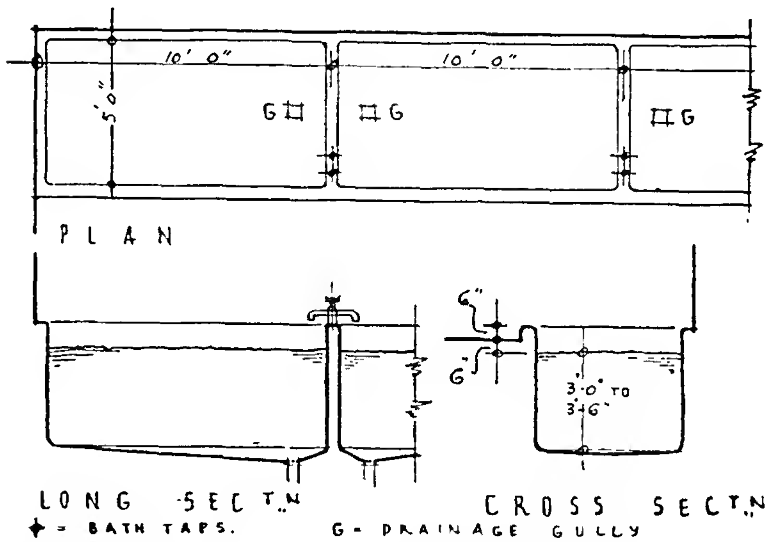



Fig. 7 Sizes of baths

### Plunge Baths

Plunge baths are sometimes provided n clubs and schools, and vary considerably in size; they are sometimes provided as a single unit in a corner of a lavatory or changing room and sometimes as a range of three or four baths in large pavilions for use by schools and university clubs. It is usual to install them in conjunction with shower baths. When single plunge baths are used they are usually about 7ft. wide and 10ft. long, and when in ranges the units are usually about the same size or rather smaller. The depth varies from 2ft. to about 4ft. 6in., but about 3ft. seems more general, since the water level must be kept well below the floor to avoid risk of sudden flooding if several persons enter at the same moment.



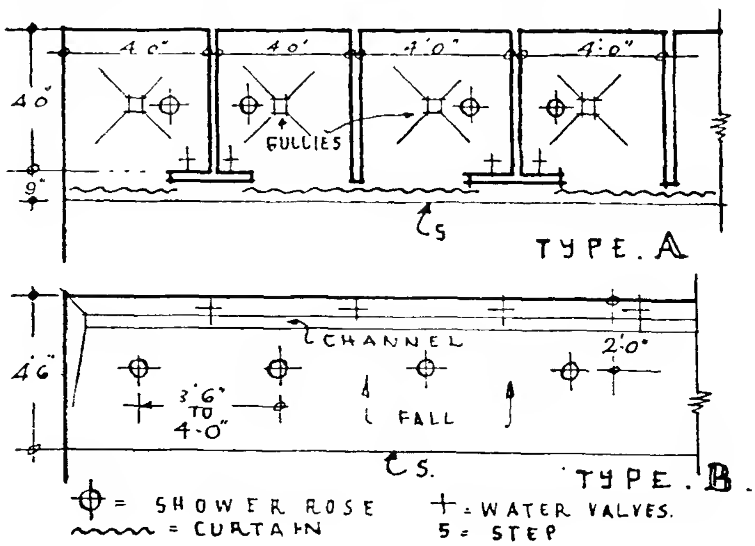

Above: Fig. 8 Plunge baths

Below: Fig. 9 Types of shower baths

### Showers

Fig. 9 illustrates two types of shower bath and the spaces required. Fig. 9 A shows each bath enclosed with a screen or division, while Fig. 9 B is a range of shower baths without separation between them.

The first type is to be preferred to the second, but is more costly; the space occupied per shower is approximately the same in both types. It should be noted that controls for the water are placed on the side wall in the first and on the side of each section in the second, and not centrally on the back wall, a position which is most inconvenient.



# Sanitation

## ARRANGEMENT OF FITTINGS

### Bathrooms

Bathrooms may be of any shape or size imaginable and may become very lavish in decoration and equipment. Basins should be as large as possible and the taps placed so as to reduce the possibility of knocking the head on them. Opinions vary as to whether mirrors should be placed directly over the basin, where steaming of glass often occurs, or on a separate wall. Good daylight on the mirror is essential, together with a proper means of artificial light. Heated towel-rails are essential. Baths are best with taps and wastes accessible and sides and ends constructed in single slabs of suitable material, or tiled. Fittings should be chosen to avoid dirt and dust-collecting pockets. Shower baths have not been used to any great extent in this country until recently, but now appear to be increasing in popularity. It is generally more satisfactory to have separate taps controlling the hot and cold supplies in preference to a single mixing valve.

### Bathroom Door and Windows

Doors may be slightly narrower than for other rooms, as furniture does not have to be taken into a bathroom; the minimum width, however should be 2ft. 3in. Windows should not be so placed that they have to be reached across the bath, as there is risk of slipping on the floor and damage may occur to the bath when the windows are cleaned.

### Bathroom Finishes

Many varieties of materials are available for decoration, but they should be selected for imperviousness and resistance to damage from water and for ease in cleaning. For the floor it is preferable that the material should be as jointless as possible and not be too cold to the feet, although coldness is to some extent counteracted by the use of bath mats.

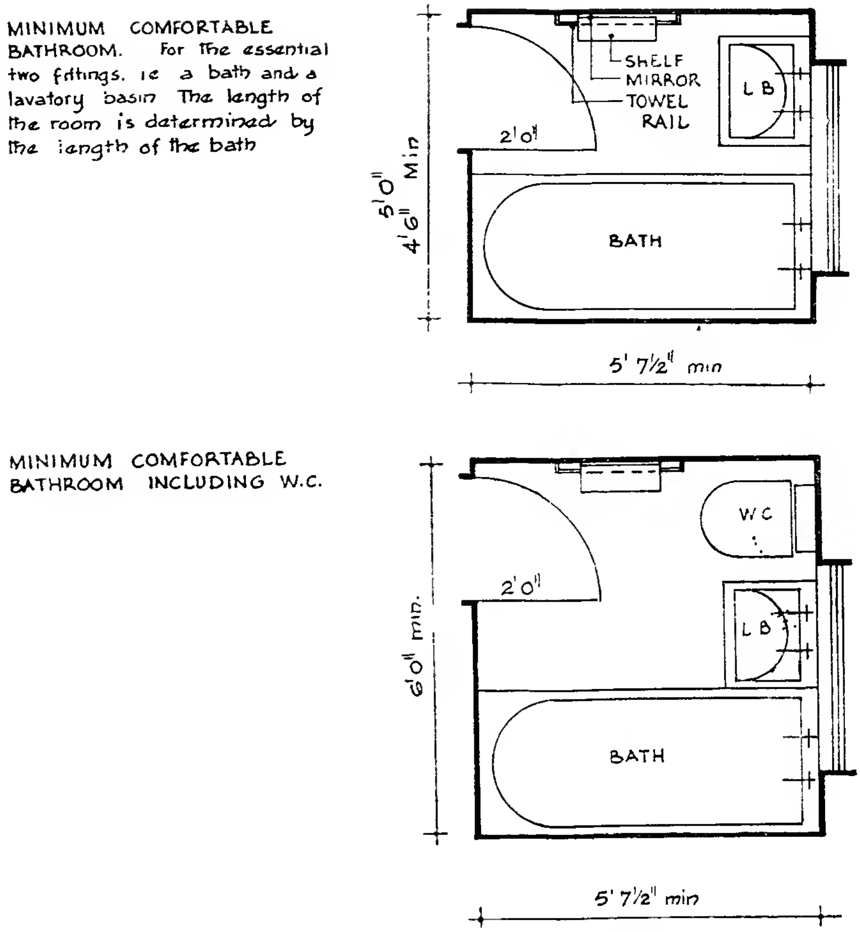
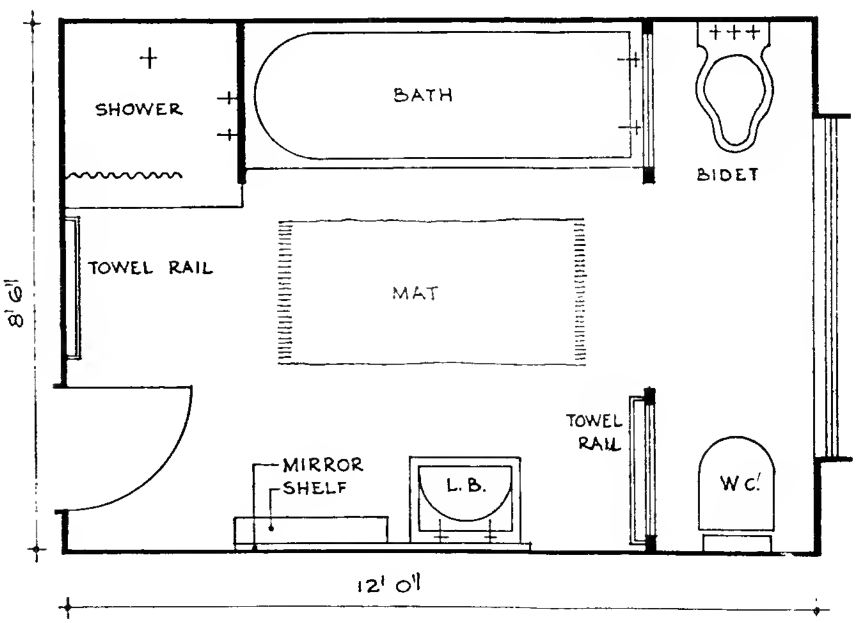



Fig. 10 Two types of bathroom with minimum number of fittings




Right: Fig. 11 Typical layout for a large bathroom, including bath, lavatory basin, shower and bidet. The bidet and W.C. are cut off from the rest of the room by glazed screens

### Bathroom Ranges

Ranges of bathrooms are sometimes provided in hostels, clubs and other types of building. Separate bathrooms fitted with a normal bath are illustrated on Fig. 12 which shows space requirements, but the length of baths may be reduced, if absolutely necessary, to 5ft. 6in.; these figures are based on the assumption that the bathrooms are not used for dressing purposes—for which general changing rooms are employed.

### Slipper Baths

Fig. 13 illustrates part of a typical slipper-bath installation, which is similar for either sex. Corridors should be at least 4ft. wide and preferably a little more. The bath room in which the compartments are placed should not be less than 10ft. high in the clear to allow for good ventilation and rapid removal of steam. The equipment needed in bath compartments comprises some form of seating, which is usually a fixed hard-wood seat, standing mats, mirror, towel rail and several coat and hat hooks. All supply and waste services are arranged to be accessible to the staff from panels in the corridor.

Fig. 14 illustrates various arrangements of bath fittings and partitions in factory buildings. Diagram A shows a plunge bath layout in which only dividing partitions are used and the front closed with a curtain. Type B is a shower bath layout in which the screens are constructed in such a manner that doors are eliminated: Type C is another shower bath arrangement in which dressing space is provided adjoining each shower: Type D shows an arrangement adopted for dressing-rooms attached to bathrooms; a bathroom is placed between two dressing-rooms, so that the baths are in use by the occupant of one dressing-room while the person in the other dressing-room is dressing or undressing. Type E illustrates the spacing of foot baths: these should be placed at least 3ft. apart, centre to centre, and preferably rather more. Duckboards of slatted construction are generally placed in front of foot baths.

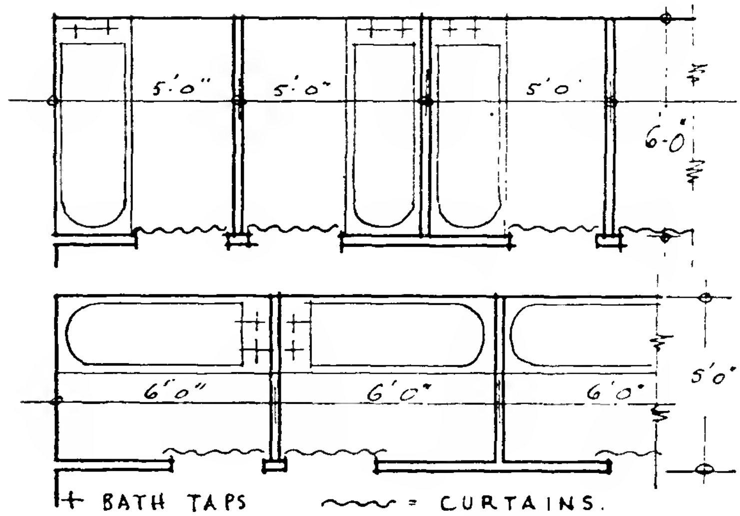



Fig. 12 Ranges of bathrooms

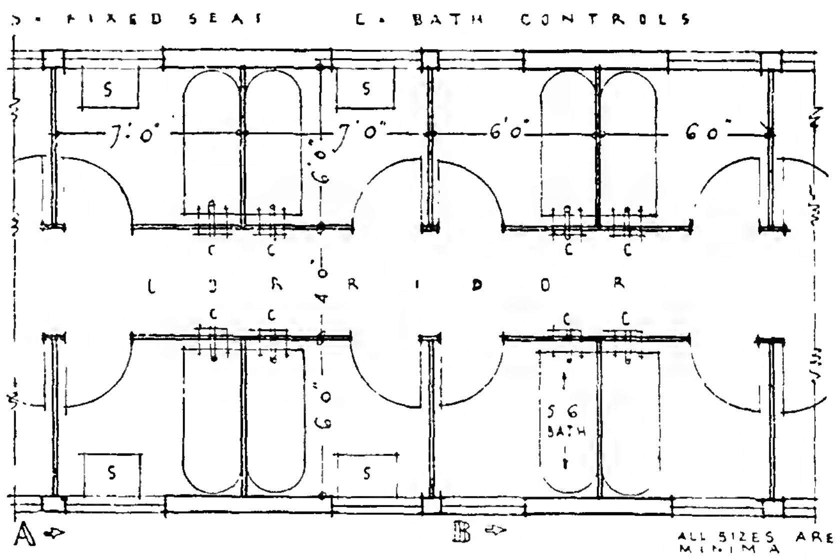
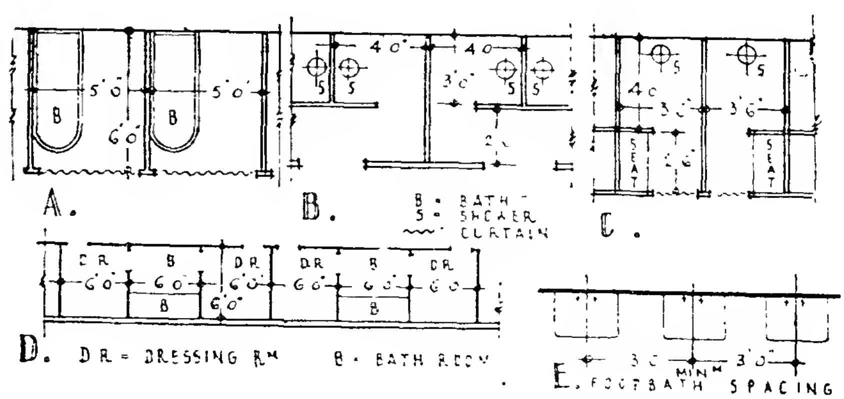



Fig. 13 Typical slipper bath installation




Right: Fig. 14 Arrangements of bath fittings and partitions in factory buildings

## ARRANGEMENT OF FITTINGS

### Lavatories

Lavatories should provide, in addition to basins, a mirror, towel rail (preferably heated) and a shelf for hair brushes, combs and clothes brushes. Care should be taken to place mirror in such a position that those using it are well illuminated both by night and day. Shelves should be either of some hard, non-absorbent material such as tiles or marble, or covered with glass. Cloakrooms used by women require long mirrors, at least two-thirds the full height of the average person and also space to sit near the mirror with shelves for powder, brushes, etc., within easy reach; or they should be planned with space for a table.

Communal lavatories should be arranged to give some kind of general circulation as, for example, those shown, which lead first to the urinals and W.C.s. then to lavatory basins and afterwards to towels, mirrors, brushes, etc. The method of providing towels varies much according to the type of building; in some, automatic spring roller towels are installed, in others separate towels are given to each person; in many offices and similar buildings each person has his own towel and brings it with him to the lavatory, thus no towel space is needed; some factories use paper towels from containers fixed on the wall, which, once used, are destroyed, while some others install electric hot-air dryers. All lavatories must have some form of permanent ventilation unless mechanical ventilation is installed; this ventilation may be provided in various ways, the most usual being either by means of air bricks or similar ventilators, or by glazing specially a part of the window with wire mesh or glass louvres. Windows should be so designed that when they are open it is not possible to see in.

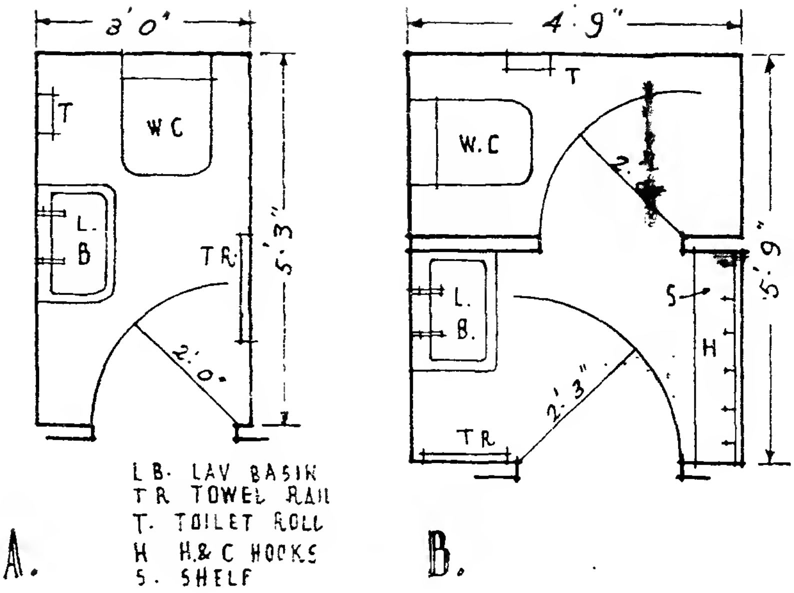
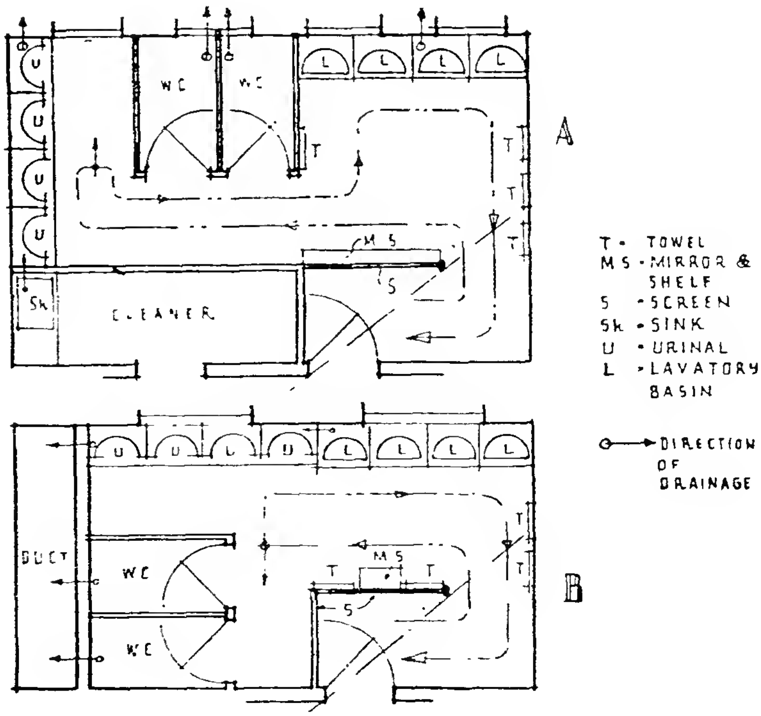



Fig. 15 Domestic or heads' lavatories (in offices, etc.)




Right: Fig. 16 Communal lavatories (men)

[illegible] as lavatories must be [illegible]ed from the approach [illegible]her external space or [illegible]e entrances may be [illegible] without actual doors. [illegible] show, by dotted lines [illegible]of vision into the [illegible]ssers-by and con- [illegible] the rooms which [illegible]gs. The greatest [illegible]usable wall space [illegible]as this is required for [illegible], either as space for [illegible] [illegible]wels, mirrors, etc. The [illegible] [illegible]e width either for ope[illegible] screens and walls sho[illegible] [illegible] there are to be ma[illegible] [illegible]e this width must be [illegible] [illegible]idered necessary. Th[illegible] [illegible]need to be more tha[illegible] [illegible]y even be reduced to [illegible]

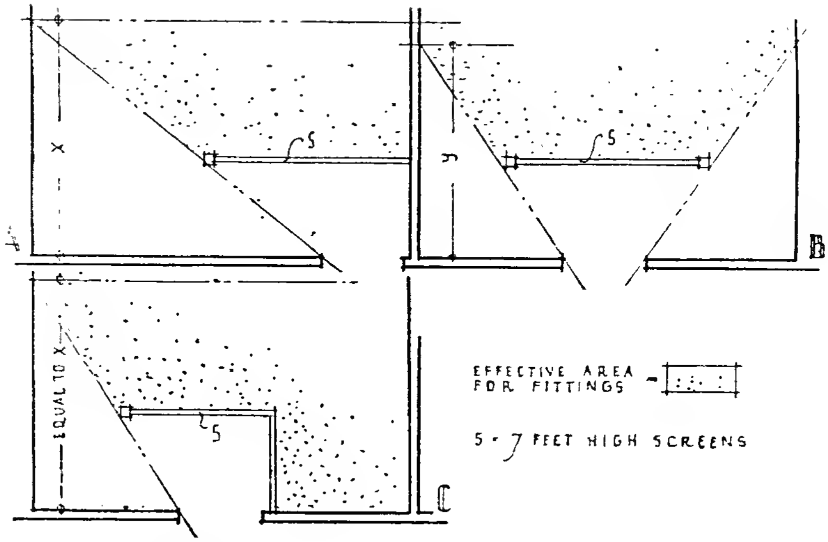
I[illegible]tter [illegible] entrance screens co[illegible] from [illegible]r level, but they are[illegible] few inches as an ai[illegible]: this is to some ext[illegible] circumstances and als[illegible]al of which the scr[illegible]

[illegible]tood that Figs. 17 an[illegible]s used as lavatory ap[illegible]ng several basins an[illegible]rinals: the W.C.s m[illegible] be placed in a separate room [illegible]ached through the lavatory itself.

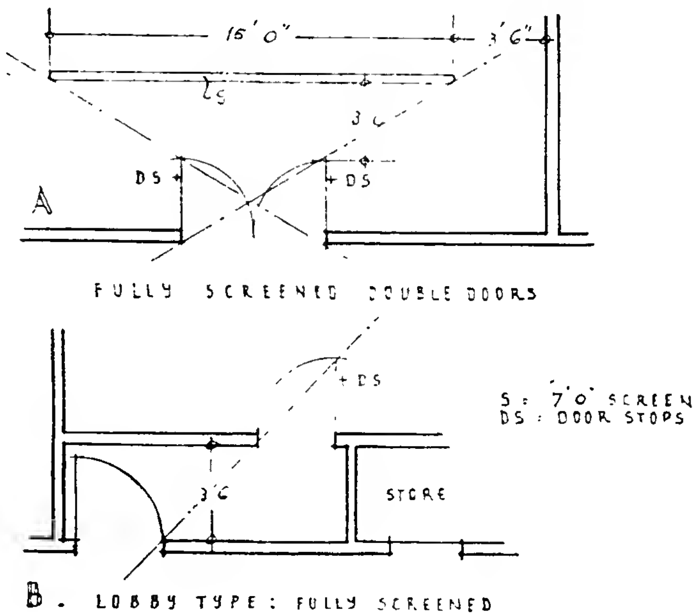
The doors on all types should be the full height of opening and should not be cut off short at top or bottom, except in circumstances where persons of the opposite sex do not approach near the doors, e.g., in lavatories attached to the changing rooms of public baths.

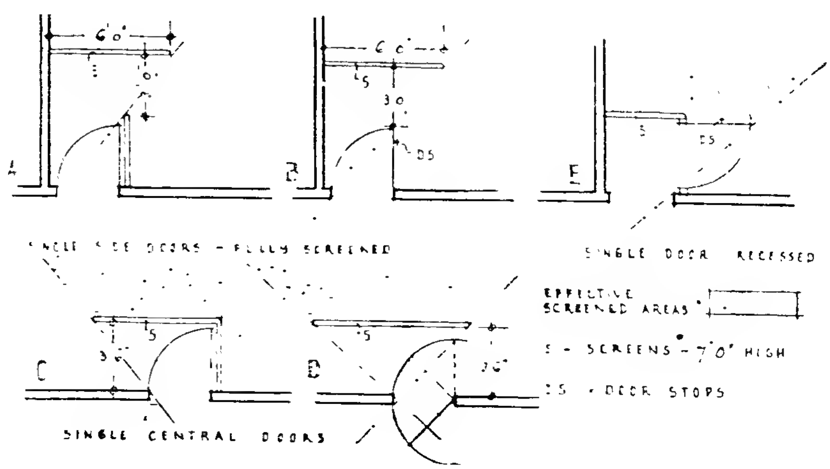
**Lobbies**

Lobbies may be lighted by glazing inner doors with obscured glass, and, if found necessary, either the upper part of the inner wall or the outer door, or both, may be glazed in addition.




Above: Fig. 17 Screening lavatory apartments Below: Fig. 18 Screening lavatories




Right: Fig. 19 Screening lavatory apartments

# *Furniture*

## LIVING-ROOM

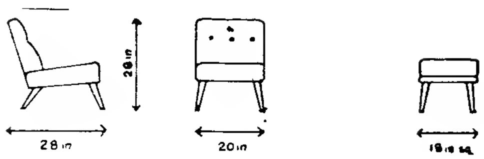



Fig. 1 Needlework chair, stool

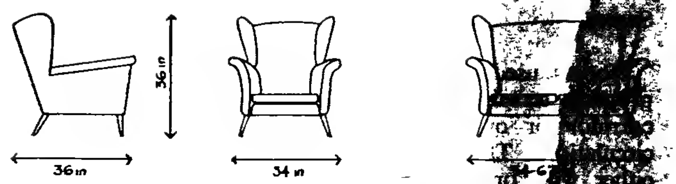



Fig. 2 Armc[illegible]


Fig. 3 Chair, coffee table

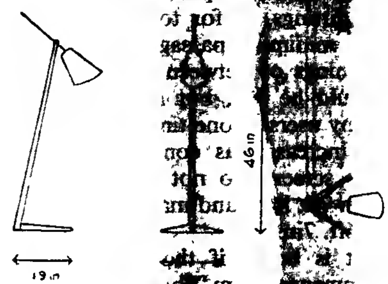



Fig. 4 Standard lamp

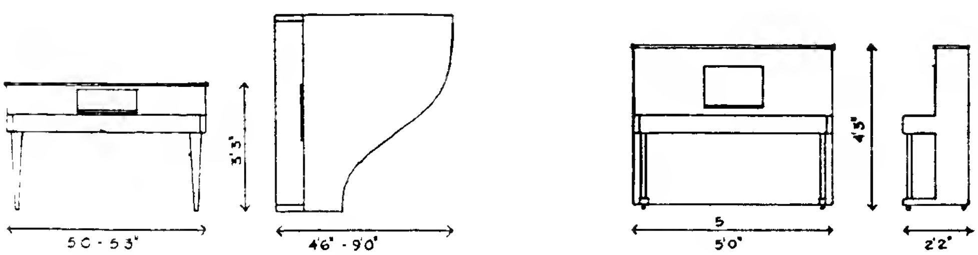



Fig. 5 Grand piano, upright piano

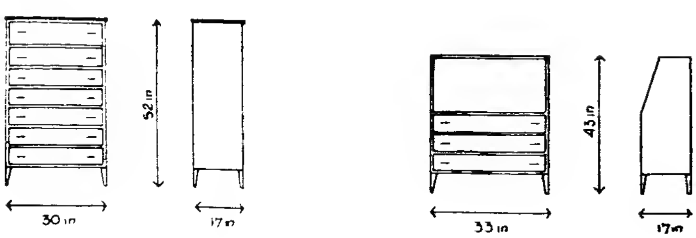



Fig. 6 Tallboy, bureau

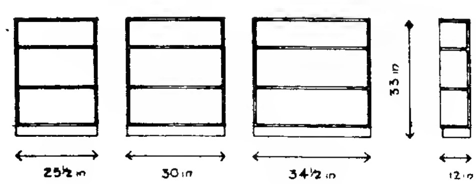



Fig. 7 Bookshelf units (from B.S. 1292 : 1945)

# Furniture

## DINING-ROOM

### General

The floor area of a dining-room should not be less than 140sq. ft. The room should be either square or rectangular, the latter being preferable, as the most general shape of tables is also rectangular, especially when fully extended. The dining-room should not be less than 10ft. 6in. wide. Windows should be placed on a long wall whenever possible, and it is advantageous to place the sill level above the table level of 2ft. 6in., which permits the table to be placed close to the window if desired.

The figure gives dimensions necessary for reasonable comfort, and at the same time retaining adequate circulation space; but in order to provide these dimensions areas greater than the minimum may be needed.

### Access

Doors should be as few as possible; direct access to and from the kitchen may be considered desirable in small houses, but it is often convenient to use a service hatch in preference to a door, since by its incorporation in a cupboard fitting, much space may be gained. Doors should not be less than 2ft. 6in. wide, so that wheeling of trolleys or the carrying of trays is possible.

### Service-hatches

The provision or not of a service-hatch between the dining-room and the kitchen or pantry is a controversial subject owing to the difficulties of making it proof against sound and smell and of arranging it so that guests do not have a view of the kitchen. The clear size of a hatch opening should be 2ft. wide and 1ft. 9in. high.

### Lighting

Light may be provided either by hanging pendants, which may be adjusted in height or by floor plugs under the table for use with table lamps. The sideboard should have local lighting, either from fittings placed upon it or from wall fittings above it, and a heating plug should also be provided for a plate-warmer.

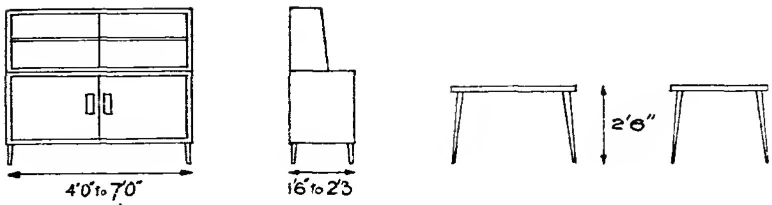



Fig. 8 Sideboard and table

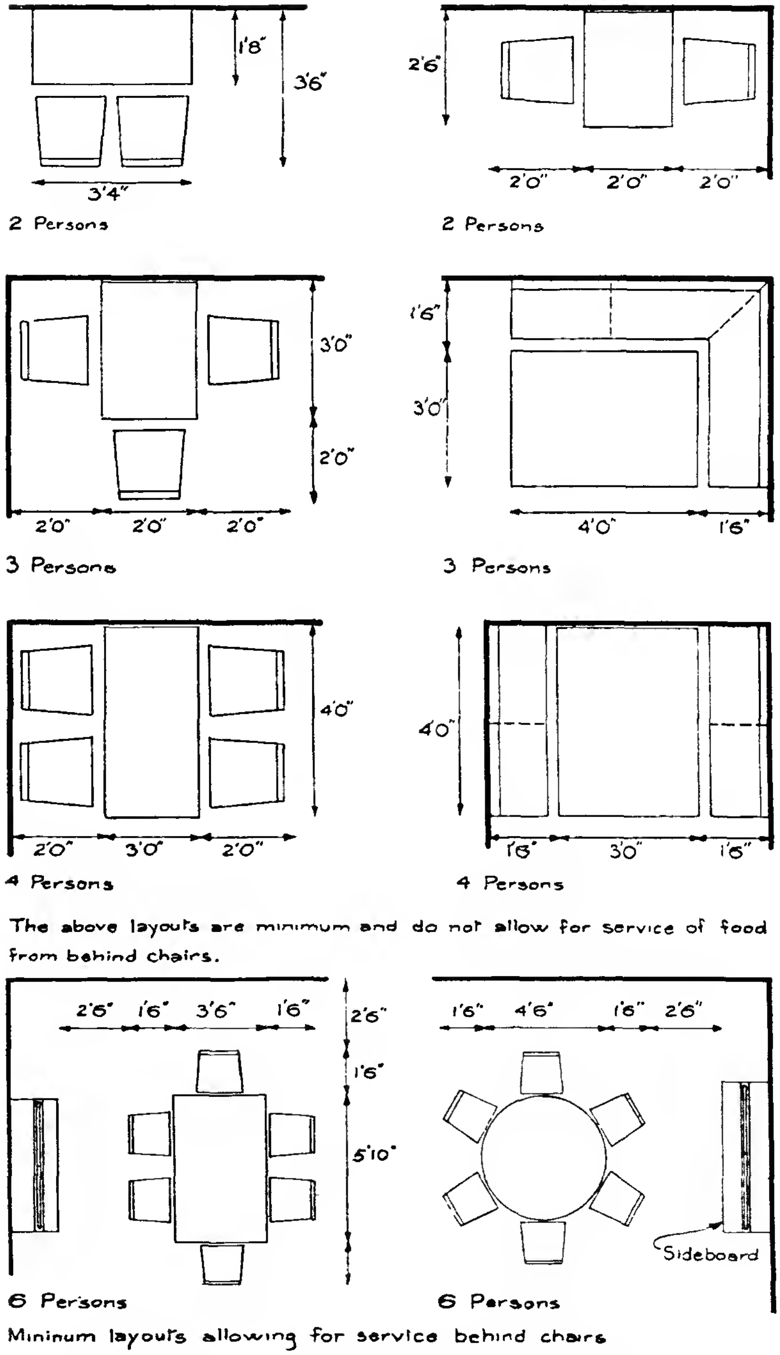



Fig. 9 Layouts for tables and seating

## BEDROOM

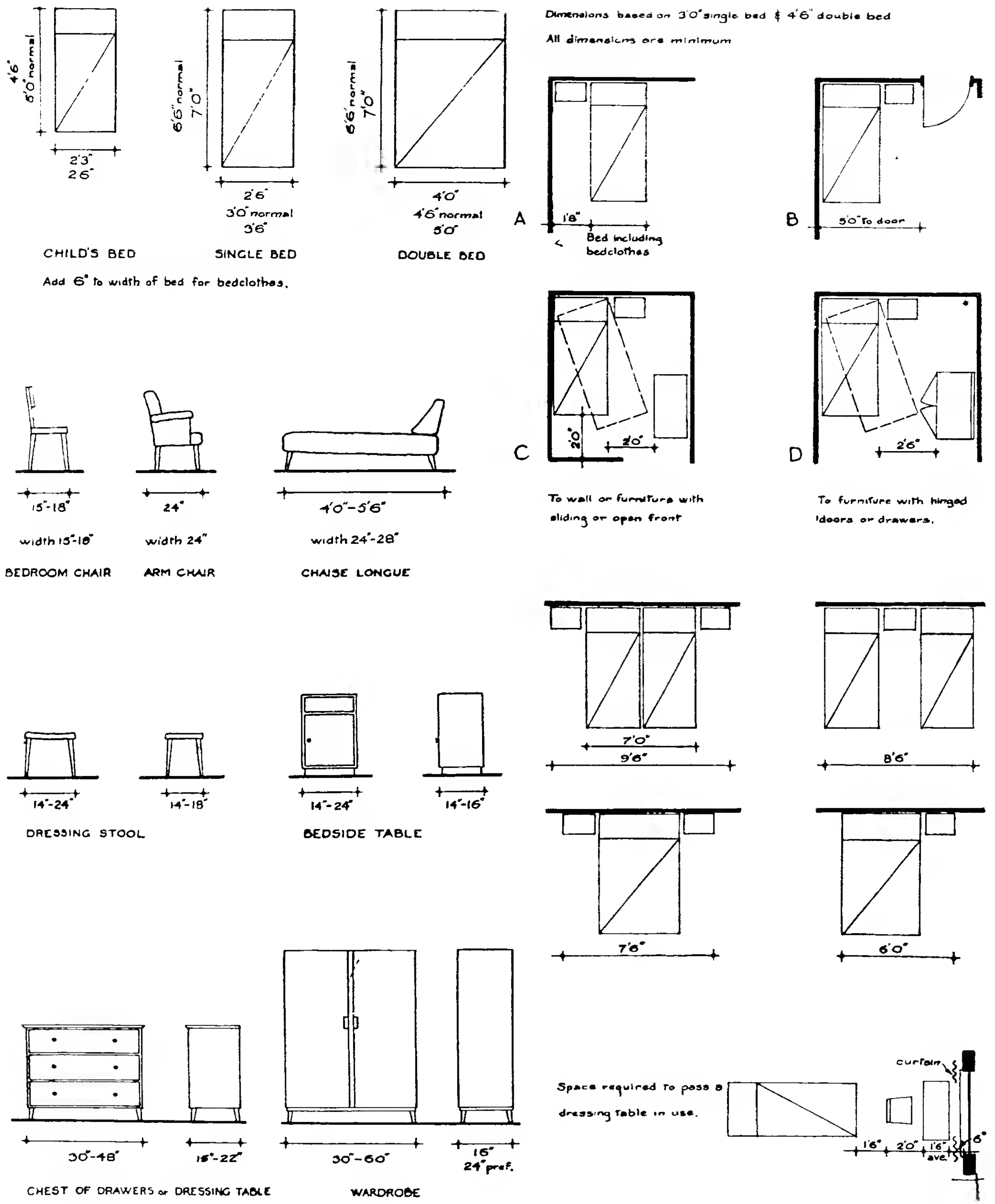



Fig. 10 Dimensions and spacing of typical bedroom furniture

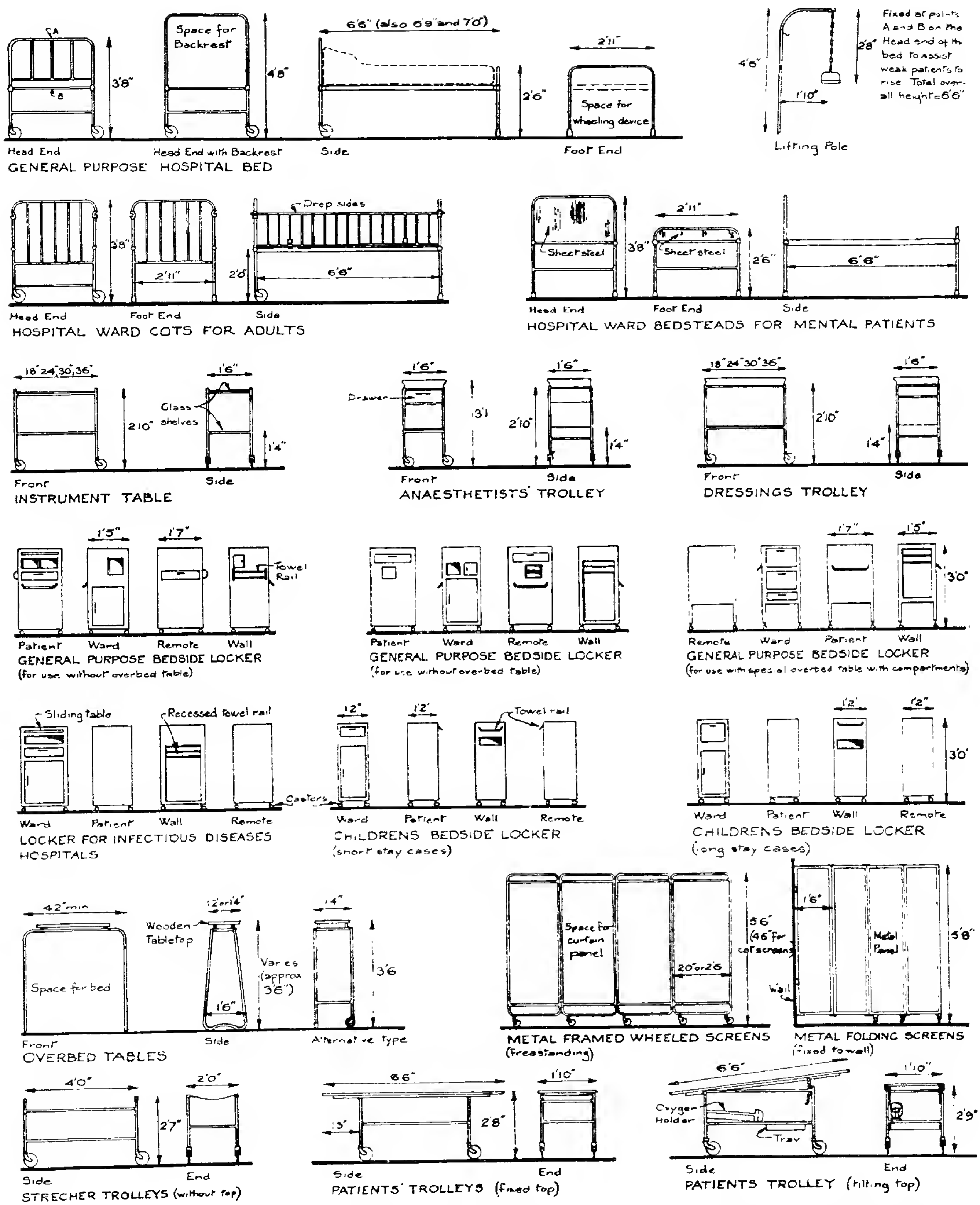



Fig 11 Dimensions of hospital furniture and equipment (from the appropriate British Standards)

# *Furniture*

## COMMITTEE ROOMS

### General

The information on this page is applicable to rooms to be used as boardrooms, committee rooms or for small meetings.

### Sizes of Committee Tables

Tables should allow at least 2ft. 3in. and preferably 2ft. 6in. run person, and when tables are used from one side only, the width should not be less than 2ft. 6in. and preferably more; tables with seats on each side should not be less than 4ft. 6in. wide for comfort.

### Layout of Rooms

The minimum dimensions for boardrooms should be based on the table sizes needed to seat the requisite number of persons, with the addition of at least 5ft. 6in. at each side and end for chair space and circulation round the room. door swings should be kept clear of these areas. The placing of the chairman is arbitrary; some committees prefer him at the end of the long table, others at the centre, as is usual when open table plans of the "U" type are used. When large numbers have to be accommodated it is desirable that no member has his back to another, although this is sometimes difficult to avoid. Generally, tables are better if made in sections which can be re-arranged to suit the number of persons to be present at any particular meeting; but with some types this cannot be achieved, as, for instance, when a large elliptical table is used.

Where committees are arranged on both sides of tables, the minimum practical width of the room is about 15ft., whereas, on the other hand, if they are arranged on one side of the table the room can be narrower, but will of necessity cover a larger area for the same number of members.

### Position of Rooms

Committee rooms should, if possible, be placed in quiet positions: this is frequently impossible and the rooms may have to overlook busy streets, when double windows are essential. The floors should be carpeted over the whole area, both to produce an absorbent and to reduce the noise of persons walking about.

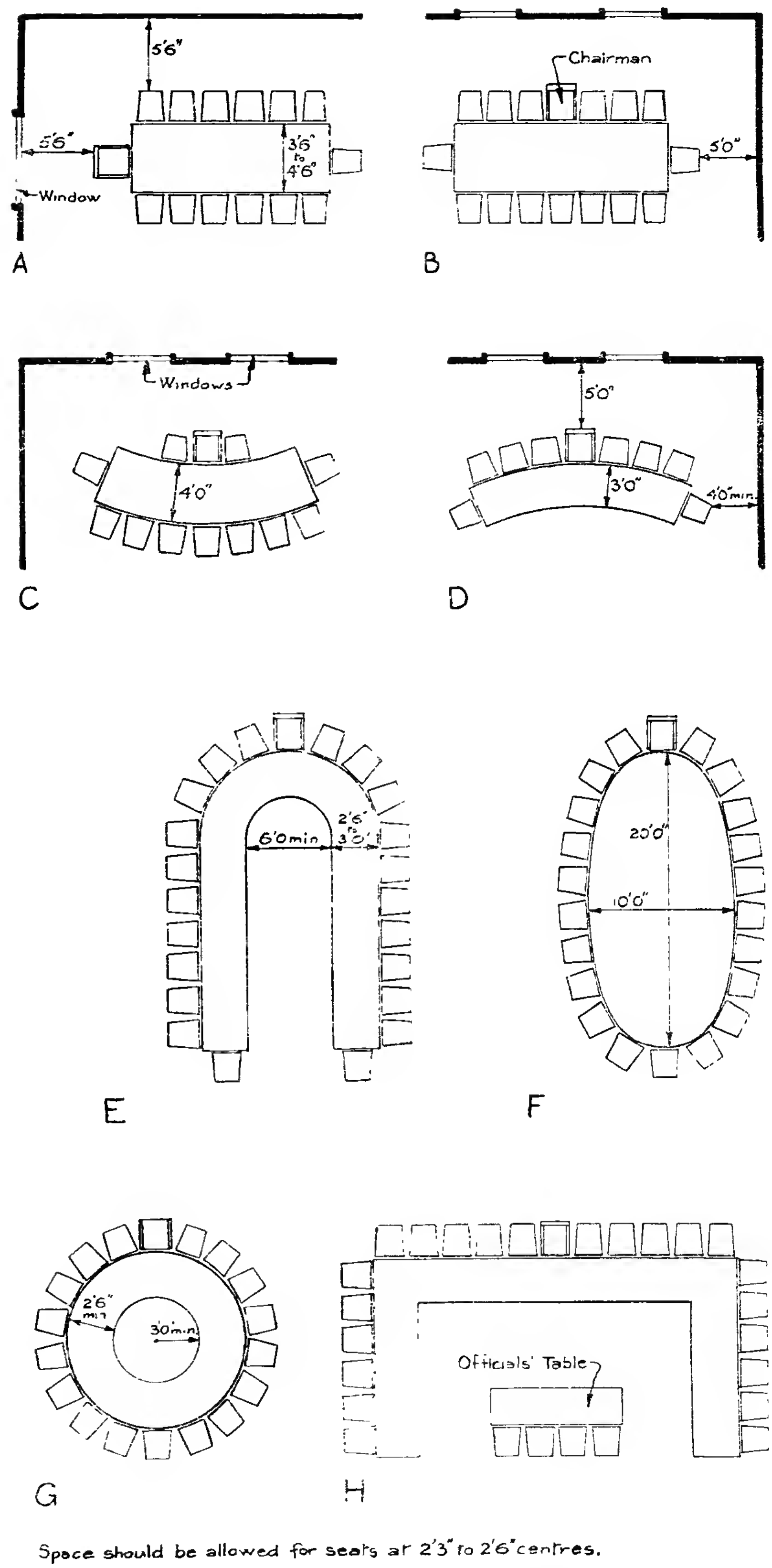



Fig. 12 Layout of tables and chairs in boardrooms

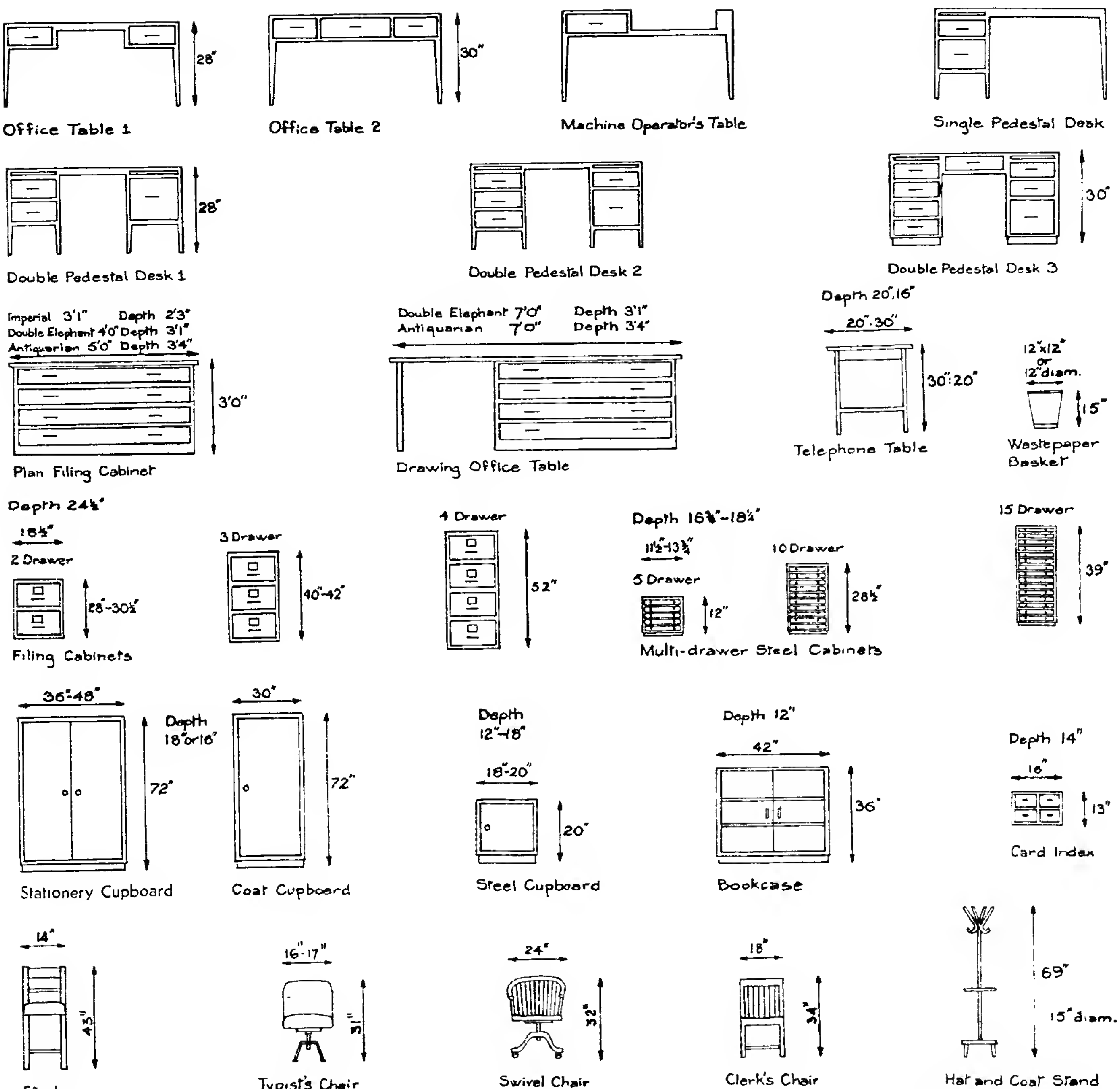



Fig. 13 Typical office furniture

SIZES OF OFFICE FURNITURE

| Sizes in inches | Office Table 1 | Office Table 2 | Office Table | Machine Operator's Table | Single Pedestal Desk | | Double Pedestal Desk 1 | Double Pedestal Desk 2 | Double Pedestal Desk 3 | Double Pedestal Desk |
|---|---|---|---|---|---|---|---|---|---|---|
| Height | 28 | 30 | 30½ | 30 | 28 or 30 | 30½ | 28or30 | 28 or 30 | 28 or 30 | 30½ |
| Material | Wood | | Metal | Wood | Wood | Metal | Wood | Wood | Wood | Metal |
| Width | 36 42 48 | 54 60 72 | 48 48 54 60 60 | 48 54 | 32 42 48 54 | 45 48 45 48 54 | 48 54 | 48 54 60 | 54 60 66 72 | 60 60 |
| Depth | 21 24 27 | 30 30 36 | 30 34 34 30 34 | 30 30 | 21 24 24 30 | 30 30 34 34 34 | 27 30 | 27 30 30 | 30 30 33 36 | 30 34 |

FOOD

### Domestic Larders

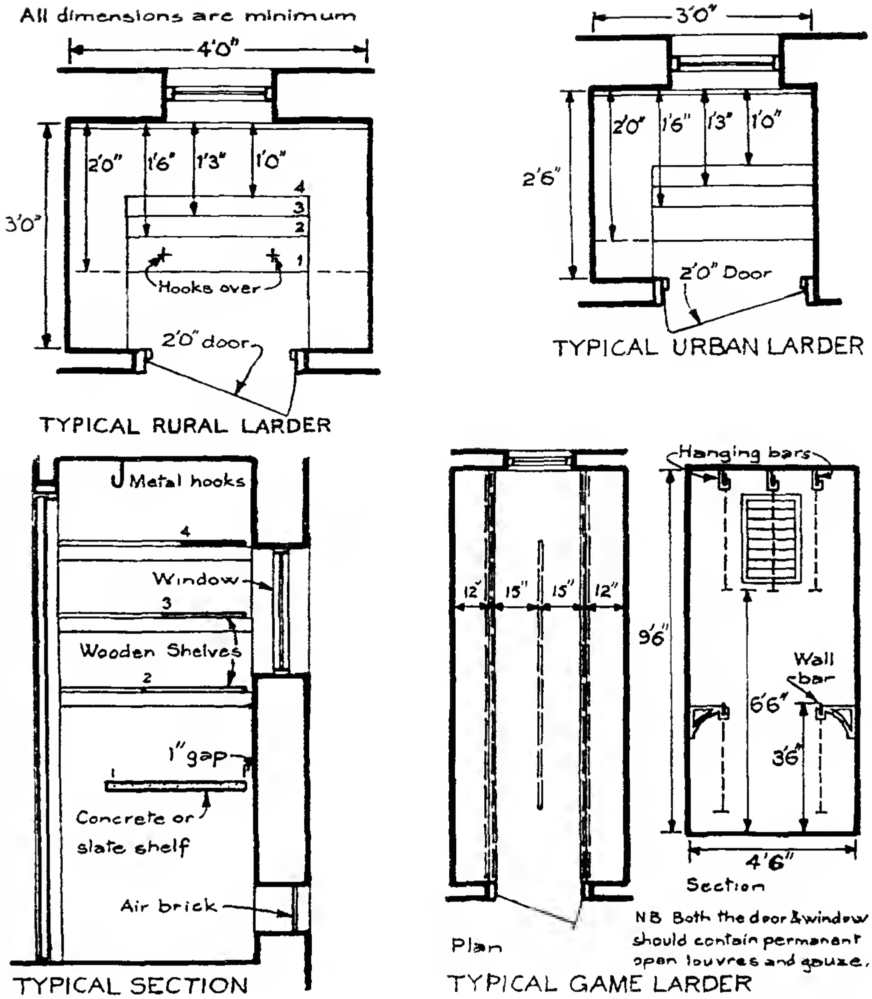



Fig. 1 Types of larders

Larders should be given a north or east aspect and should have ample ventilation, either by windows or gratings, both of which should be effectively protected against ingress of flies, wasps and mice. Windows are preferable in larders which are not well lighted when the door is opened. Larder windows are generally designed to open inwards to permit the easy fixing of external fly screens. Ventilators should be so arranged as to provide a current of air: thus, a single air brick is of little value and one should be placed near the top and another near the bottom.

The area of shelving needed must vary according to shopping conditions: thus in urban dwellings small areas are adequate, but in rural districts more shelf space is essential.

In urban dwellings larders should have at least 4sq. ft. of clear space (about 2ft. 6in. by 1ft. 6in.) but a larger area should be planned whenever possible. Its door should be placed on the longer dimension to obtain full benefit of the space available: it should be 6ft. 6in. high, with upper cupboards for reserve storage, or better, the full height of the ground floor, with high-level shelving. One shelf should be of material such as compressed asbestos cement, slate or concrete. This shelf should be about 3ft. above the floor. Shelves should not be more than 2ft. 6in. in depth, as it is difficult to lift dishes from a greater distance without risk of accidents. Wide shelves at a higher level than 5ft. above the floor are valueless for normal larder storage. Widths of shelves must be related to spacing apart of the shelves above and below. The lower part below the cold shelf may, with advantage, be fitted with metal grids on which bread and vegetables may be stored. Shelves should be placed about 1in. clear of walls to allow proper circulation of air and should not be too close to doors.

In rural dwellings larders should be increased to at least 10sq. ft. in area and even more in outlying areas. Spaces about 4ft. long and 2ft. 6in. deep with the door on the centre of the long side are the most satisfactory. Shelves should be graduated in width: shelves of more than 2ft in depth are of little value, as also are shelves of less than 9in. wide. Ceiling hooks for hams and poultry are desirable in rural areas

Floors of larders should be smooth and of materials which are easily cleaned, such as tile or granolithic. Walls also should, unlike the general practice, be smooth and easily washable, as they tend to become very dirty especially near the shelves. The larders should be enclosed in such materials as will reduce heat penetration from the kitchen and should have well-fitted doors.

Larders should not be put near cookers or ranges, and care must be taken to avoid the passing of hot pipes through larders.

*Game larders* have to be provided in the country. Essential factors are a constant current of cool air, a large number of ceiling hooks and fly-proof screens.

Sometimes game larders are constructed as independent buildings in charge of the gamekeeper and sometimes they form part of the accommodation of the house. Cross ventilation is essential and is usually provided by means of louvred openings covered with zinc gauze and sometimes, in addition, doors similarly treated. The doors should, if possible, open outwards to increase the useful area. The height should be at least 8ft. 6in. and preferably 9ft., so that it is possible to walk under hanging game without difficulty; the game is suspended from tinned hooks hung over 2in. by ¼in. galvanized iron or stainless steel flats fixed a few inches below the ceiling and placed at least 15in. apart and 12in. from walls, so that the feathers of birds or skins of animals do not touch. Wall brackets at a level of 3ft. 6in. may also be used as shown in the figure to carry additional hook rails.

## Domestic Storage

In larger houses special wine cellars are generally provided. Rooms for this purpose should be dark, cool and capable of maintenance at even temperatures.

Wine and spirit bottles vary somewhat in size and shape according to the brand, but it may generally be assumed that 14in. is normal, and that 15in. is a maximum bottle height; all but a few special spirit bottles and certain brands of colonial wine may be placed in racks allowing 4in. by 4in. spaces. There are two general types of bottle rack or bin, both of which can be made up to suit any shape or size of space provided. The first type is the "French wave" pattern, which consists of wrought-metal racks, the front rails of which are designed in waves with a pitch of 4in. in which the bottles rest horizontally; the second type consists of a light metal framework held apart by 1in. by 1in. wooden battens placed diagonally so that the sloping sides of the battens support the bottles; the latter type is generally made with 4in. by 4in. spaces, and measures 9in. overall back to front for single-sided bins, or 18in. for double-sided bins. The first type is generally about 12in. back to front for single-sided bins and 1ft. 7in. deep for double-sided bins. Stock-sized bins are also made up of both types by many manufacturers.

Shelves may be either adjustable metal shelving about 14in. or 24in. deep, or tiers of slate shelving usually 2ft. wide supported on half-brick division walls, spaced 3ft. to 5ft. apart. The space between ranges of bins or shelves should not be less than 3ft.

A decanting bench is sometimes required, about 2ft. wide, 5ft. long and 2ft. 6in. above the floor, very strongly constructed of heavy timbers. Space may also be needed in a large cellar for bottle washing and a corking machine.

Beer may be required to be stored in barrels which are placed on "barrel tilts." The usual barrel sizes for domestic purposes are a "firkin" (9 gallons), 17in. diameter, 1ft. 4in. long; a "small cask" (6 gallons) and a "pin" (4½ gallons), about 13in. diameter and 15in. long.

### Fruit: Domestic Storage

Fruit is most satisfactorily stored on shelves of wooden slat construction or in trays similarly made. Darkness is desirable, together with ventilation which can be controlled in frosty weather. The room or building must be constantly cool and therefore placed in such a position that the south and west walls are internal ones, or alternatively made sufficiently thick; roofs should be insulated against the heat of the sun and also cold, and in many districts thatch is often adopted for this reason. Ventilators should be built in in such a manner that constant ventilation is provided, but they must be capable of proper closing against frost, and provided with fly screens.

Shelves, when fixed should not be more than 2ft. in depth and should be spaced about 12in. to 15in. apart vertically. The shelves are generally constructed of wooden slats ¾in. to 1½in. wide by ¾in. to 1in. thick.

If the shelves are made in the form of trays in racks the vertical spacing may be reduced to 6in. in the clear, with a few shelves for very large fruit about 9in. apart. The depth of the trays may be as much as 4ft. back to front and the width up to 3ft., but such trays become very heavy to handle. The gangways must be wide enough to allow the complete removal of the trays and for space in which to turn them when removed. This method, although more elaborate, allows of a greater amount of storage in a given space.

Fig. 2 shows a typical plan of a small fruit room, together with a section which illustrates the maximum height (5ft. 2in.) at which the highest shelf can be placed unless steps are used for access. The fruit must be easily visible so that it may be looked over day by day quickly and without great effort. The back slat of each shelf should leave a slight space for air circulation between the wall and shelf.

Also shown is the tray type of storage and this also should not be placed at heights from which it is difficult to lift out the trays. In both types an edging piece is needed to prevent the fruit falling from the shelves or trays.

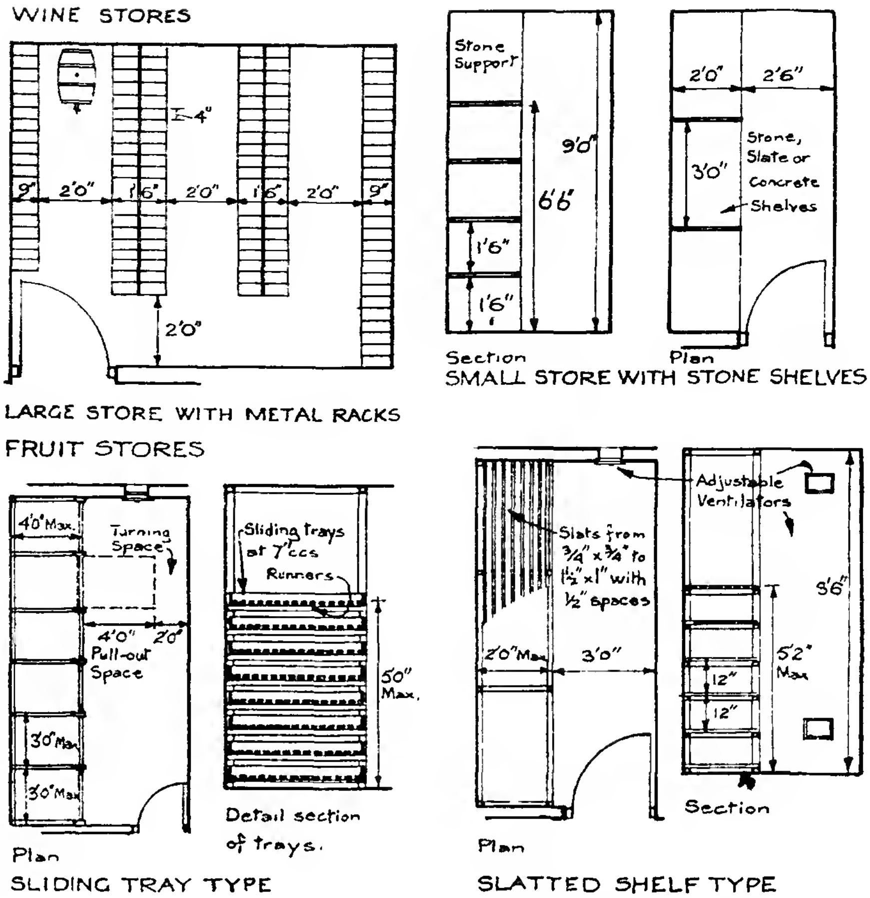



Fig. 2 Alternative methods of storing wine and fruit

## LINEN

### General

A heated linen cupboard is a necessity in every house; it is best placed on the main bedroom floor. It should not open off the bathroom (as is so frequently done), as steam cannot be prevented from penetrating the cupboard and damping the contents. Large linen cupboards are often planned as small rooms with shelves on each side, but smaller ones should be placed so as to open on the long side.

### Shelves

Shelves should be spaced about 12in. to 15in. apart, and should have a depth of at least 2ft., and are better if 2ft. 3in. deep; this depth permits of the placing of folded articles " end on." If, however, it is impossible to obtain the depth given, the dimension should in no instance be less than 18in. A shelf length of at least 3ft. should be provided in a three-bedroom house. The lowest shelf should be at skirting level to avoid dust entering under the door. Shelves should be of the slatted type, consisting of 2in. by 1in. wooden slats spaced ½in. apart: the front and back slats being at least 1in. from the door or wall to permit of air circulation. The factors which control the shelving depth are that everything should be visible from the front, and the sizes of large sheets and blankets folded after washing, which are 1ft. 10in. by 7in. for the former and 24in. by 24in. for the latter. (*See also* Fig. 3.)

### Lighting

Daylight from windows is unnecessary in linen cupboards unless they are very large in area: but both natural and artificial light should shine into the cupboard when the door is open. If artificial light is provided within the cupboard it should be placed near the door so as to light the whole cupboard.

### Ventilation

It is advisable also to provide a small amount of ventilation such as 6in. by 2in. panels filled with wire gauze in the top and bottom of the door.

### Heating

The heating of the linen cupboard should be made part of the domestic hot-water supply system, and not the heating system, so that heat is provided throughout the year even when the heating system is closed down during the summer months. Heating may be arranged by placing the hot-water cistern in the cupboard or by using a radiator or pipe coil; the latter system is more satisfactory, as just sufficient heat may be provided by a radiator having the correct area of radiation surface.

On the other hand, if the cistern is used, excessive heat is provided and therefore valuable heat is lost which might be retained for the hot-water service by lagging the cistern.

### Linen Cupboards

Fig. 4 illustrates two linen cupboards of equal area. Diagram A shows a well-planned layout in which every article is easily accessible and the greatest advantage in storage space is obtained from the area, while Diagram B shows a usual but very uneconomical arrangement; even if the door of Type B opens outwards no advantage is gained, as in that case the shelves are too deep.

Pairs of doors as in Diagram A are better than a single centrally-placed door, since direct access is possible to the front corners of the shelves.

### Linen Rooms

Shelves are best confined to one or two sides and not placed on a third side, such as the end wall opposite the door, as the loss of space on side shelves is not offset by the gain on the extra short shelf length by reason of the corners becoming useless. The minimum useful linen room is shown by the dotted line in Fig. 5, but in this case the door must open outwards. The shelves are arranged so that on one wall are deep shelves for large articles, such as sheets, blankets and quilts, and on the other wall are shallower shelves for smaller articles, such as towels and pillow-cases. The most useful shelf-space is that between 2ft. and 6ft. above the floor, and this should be used for the articles in everyday use, while the lowest level and upper part, which are more difficult to reach, may be used for storage of mattresses, mattress covers, pillows and spare blankets, access to which will only be required intermittently.

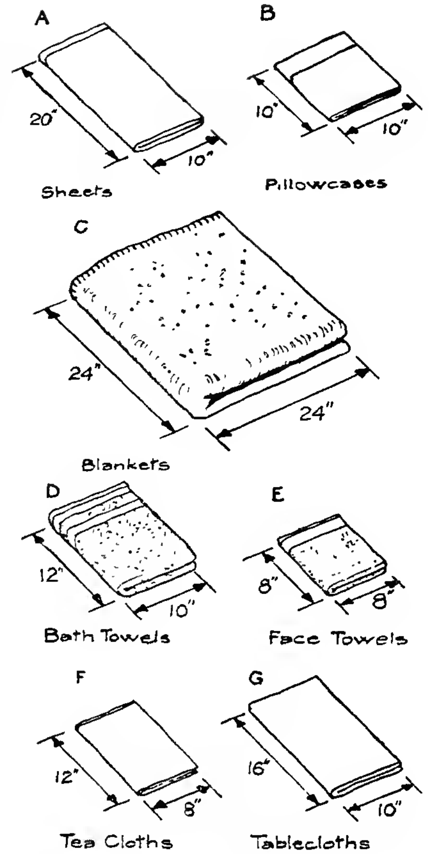



Fig. 3 Approximate sizes of folded linen

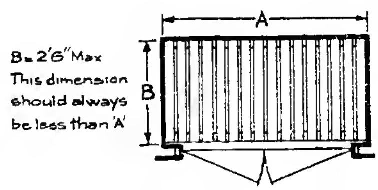



Fig. 4 Linen cupboards

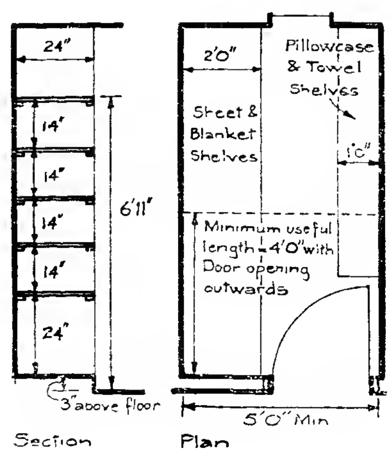



Fig. 5 Linen stores

### Fuel for Houses

In the design of most domestic buildings, fuel accommodation for two types of fuel is required; first, that for ordinary fires (coal); and, secondly, that for boilers (coke), and, in some instances, a third type is also necessary when certain heating or working apparatus is using hard coal (anthracite) as opposed to soft coal. In country situations accommodation is, in addition, often required for logs. The amount of storage necessary for each type largely varies according to the proximity of the site to railway stations, or other sources of bulk supply; it should be remembered that it is advantageous to buy most fuels in large quantities, such as by purchasing a full truck load and also that prices are lower in the summer, and if sufficient storage is available it is more economical to buy then for the winter months.

The planning of fuel stores varies considerably with the type of house, but it is very important that there should be easy access for deliveries from without and, if possible, long walks for coalmen from the nearest roadway to the fuel store should be avoided. When several sorts of fuel have to be accommodated, the stores are sometimes separated for each type and placed in different positions; thus, coke for boilers is stored near the boiler-room, and other fuel in convenient places for access to the rooms of the house. It is preferable that all access from the house to fuel stores should be under cover (if not placed within the house) and, when stores are within, the building should be so placed that dirt and dust cannot penetrate to any rooms in the house.

The amount of space required per ton for the various types of fuel is:—

| | |
|---|---|
| anthracite | 37–41cu. ft. |
| coke | 90–100cu. ft. |
| coal | 41–45cu. ft. |

It is usual to provide a small area of permanent ventilation in fuel stores near the ceiling in the form of air-bricks, or by a series of holes in the door.

Any entrance door through which sacks of coal must be carried should be at least 6ft. 6in. high, which should be also the minimum height of the store space itself. If delivery hatches are installed these should be about 3ft. 6in. above the ground level to the top of the sill, and never more than 4ft. Delivery openings with hatch doors should be 2ft. wide and 2ft. 6in. high, and the sill should be specially strong to withstand the very hard usage to which it will be subjected. If hinged hoppers are fitted, they should be at least 1ft. 9in. square and, better, 2ft. square; there is a good commercial type of cast iron or steel wall-hopper 2ft. 10in. square overall, giving a 2ft. 6in. square opening. Hoppers should open to an angle of about 45° and be provided with very strong stops or chains. The brick internal sill should be formed of very hard bullnosed bricks. Hoppers should be placed either on the back wall opposite the door through which the fuel is to be removed, or on a side wall near the back wall. All fuel stores should be equipped with bunker boards to ensure economical use of a given space; alternatively, removal hatches should be provided in brick partitions, the hatch being 2ft. wide by 15in. high.

It must be borne in mind that it is difficult, when standing on a level floor, to shoot coal or coke out of sacks to a greater depth than 4ft. All fuel bunkers or stores should be equipped with " coal boards " to ensure the economical use of a given space; coal boards are usually 7in. or 9in. wide by 1in. or 1½in. thick deal boards dropped into grooves in two vertical posts about 4in. by 3in. securely fixed to the walls or floor; slots for lifting the coal boards are cut in the lower edges. Coal boards do not need to be more than 4ft. high in normal circumstances.

It is helpful to construct a baffle (as in Fig. 6) behind the bunker boards, in such a way as to leave a permanent space at the foot of the adjustable bunker boards, to be used for the removal of fuel.

Fuel stores in urban districts are often placed in basements or in vaults under pavements, to which deliveries must be made through coal-plates and chutes in the pavement. The maximum sizes of coal-plates placed in public pavements are controlled by by-laws in some districts: the usual standard sizes are 12in., 14in. and 16in., but a maximum of 14in. diameter plates is very general. The chutes leading from the plates into the stores, when the plate is over the storage space, are usually circular and made of brick or concrete slightly larger than the actual plate, but when the chute leads from the pavement through a wall to a basement not under the plate, the plates are often square or rectangular with rectangular sloping chutes up to 18in. or 24in. wide. A slope attached to a chute of this kind should be not less than 45° to the horizontal.

It should be noted that in large fuel stores it is desirable to leave a space about 4ft. wide between the coal boards and the door wall in which tools, scuttles, etc., may be placed.

Care must be taken that the enclosing structure of fuel stores is of adequate strength and the facing of the walls and floor of such materials as will withstand the impact when fuel is being delivered and the general wear and tear arising from the movement of rough hard materials. Floors should be smooth and hard, such as concrete, and it is advantageous that they should slope slightly towards the removal position, but the slope should not exceed 15°, to avoid placing an unnecessary load against the bunker boards.

A small area of floor adjoining the bunker boards or removal hatch should be horizontal.

If a removal hatch is installed, it is desirable that the floor opening should be covered with a smooth metal surface.

Use of oil for boiler firing has increased very considerably in recent years and a very important point which must be considered when planning an oil fuel storage tank is this: it should be placed in such a position that a lorry may be driven within a very short distance of the tank, or at least a gravity feeding pipe should be installed near a roadway leading to the storage tank. Storage tanks are usually placed below ground, but in some circumstances in small installations the tank may be placed in the boiler room if a suitable brick or concrete casing is built around the tank.

Storage should be provided for a month's supply of fuel, with a minimum capacity of two tons (a small tank load), which requires about 80cu. ft. of tank space.

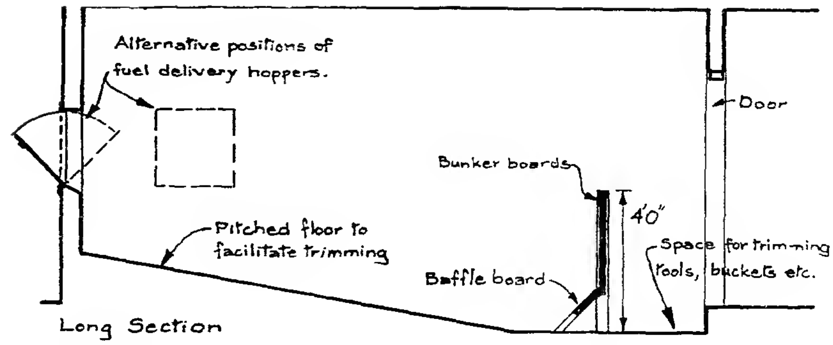
# *Storage*

## FUEL

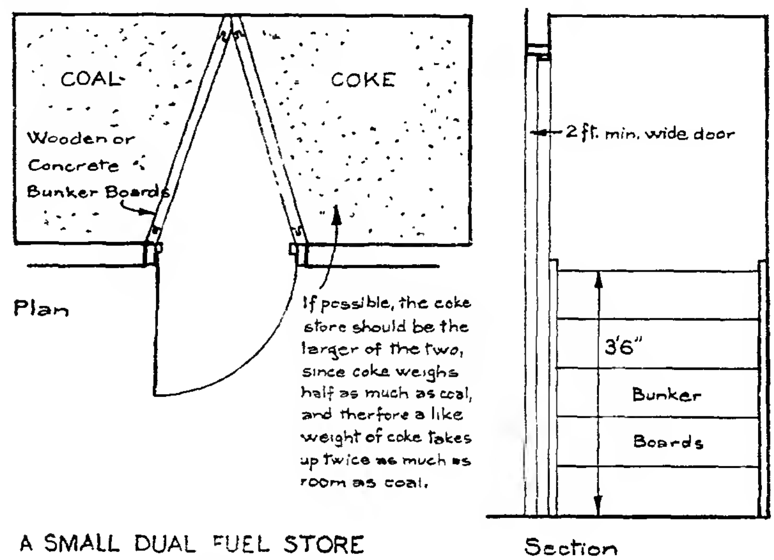
### Fuel for Flats

Fuel storage presents one of the difficult problems of flat design. If it is placed inside individual flats, much dirt and dust is caused, delivery is complicated and suitable storage accommodation is difficult to provide; this system, however, has to be adopted in the lower-rental types, where porters are not available to carry the fuel from basement stores. The actual accommodation is provided in the form of bins or cupboards generally placed in or off corridors. The bins are usually about 2ft. 9in. wide, 1ft. 6in. deep, and 3ft. high, which is sufficiently large to hold 2cwt. of coal. The bins should be constructed of galvanized iron or framed up in wood and lined with sheet iron. Cupboards, when used for fuel, should be fitted with removable bunker boards and lined with sheet iron, unless the partitions are of brick. Solid floors are essential.

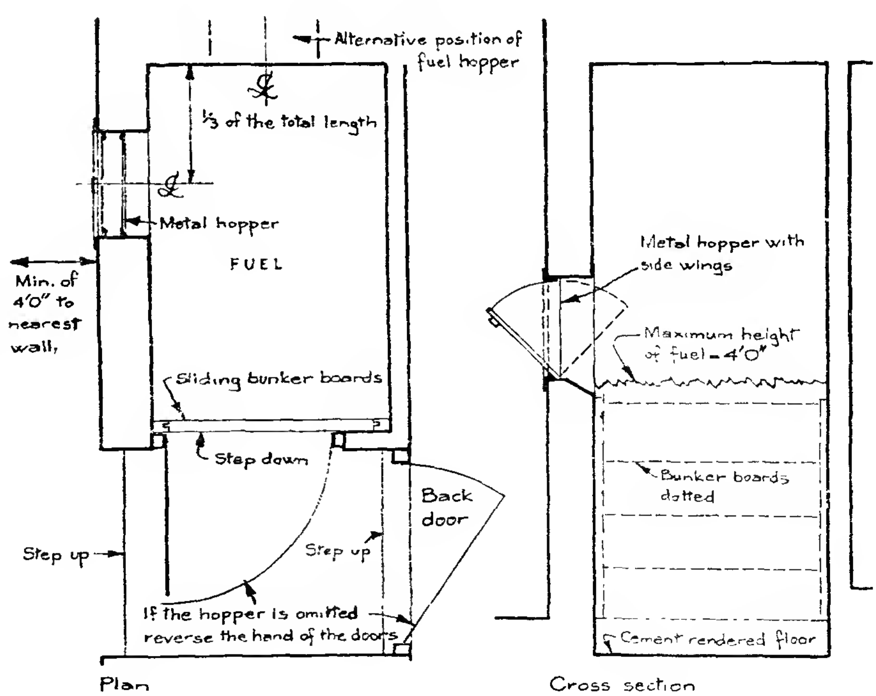
Unless a central hot-water system or local heating such as gas or electric geysers or circulators is installed, coke storage for independent boilers may be required in addition to that for coal. The amount of fuel storage required in all types is comparatively small, as usually few coal-burning fires are installed, and even in the large types where several open fires may be provided, few are regularly used owing to central heating being normally adequate. In better flats fuel is stored in the basement and carried to the flats daily by the porters; this storage is worked on one of two systems, either small individual storage for each flat or bulk storage, from which the fuel is sold per scuttle to the tenants by the porter. The latter is more simple from a planning point of view, but is unpopular with tenants. When individual fuel stores are provided, about 30sq. ft. per flat is sufficient when coal boards are used, and this allows for the fuel being stored to an average height of 3ft., this amount giving a capacity of one-and-a-third tons of coal or of three-quarters of a ton of coke.




A LARGE FUEL STORE FOR COAL OR COKE




B A SMALL DUAL FUEL STORE




C A TYPICAL DOMESTIC FUEL STORE

Right: Fig 6 Layout and dimensions of three methods of fuel storage

## Consumption of Fuel

As a guide, a minimum amount of storage equal to four weeks' peak load requirements should be the aim for all new buildings, except in the case of factories where this figure should be increased to six weeks: extra storage should preferably be included. Buildings of the same order of size will vary in their fuel consumption, depending on the design and construction, and also on the periods during which they are occupied and the efficiency of the installation.

The importance of automatic temperature control to regulate the output of the heating plant to the actual heat requirements of the building cannot be over-emphasized: the more efficient the installation, the less space required for fuel storage.

## Deliveries

The desirability of bulk deliveries, in the interests of speed, cheapness and economy in man-power, cannot be over-emphasized. It is therefore strongly urged that in all new buildings of sufficient size to justify bulk delivery —and that in fact means virtually all new buildings other than houses— suitable facilities for this purpose should be included.

Access roads should have a minimum width of 10ft. 6in. and adequate space should be allowed for turning and backing. On sharp turns the road width should be increased to 14ft.

## Spontaneous Combustion

If the heat generated in a stack of coal can be dissipated before the critical temperature is reached there is no risk of the stack taking fire. Although this can be achieved by the thorough ventilation of the stack, in practice, except in the smallest stacks it is difficult to ensure. Alternatively, if the quantity of air reaching the interior of the stack is insufficient to support oxidation, the heating process will be arrested. This may be achieved by the suppression of ventilation and is a much more feasible propostion, particularly with large stacks. Ventilation may most simply be suppressed by blanketing the stack with a layer of slack.

The height of the stack has an effect on the liability of the coal to heat up. Freshly mined bituminous coal should not be stacked higher than 8ft. For some coals higher stacks may be built without the precaution of laying down the coal in successive layers at long intervals. Stacks up to 16ft. high are permissible for bituminous coal of suitable size and type and anthracite may be safely stacked up to 30ft. high.

## Open and Covered Storage

Covered storage space may only provide a relatively limited amount of storage, sufficient, for example, to meet the needs of one week. Outdoor storage can then provide a reserve from which the covered store can be replenished when required. The relationship of these two kinds of storage is largely determined by the properties of the fuel. As coal deteriorates more rapidly in the earlier stages of storage it follows that coal should be used as soon as possible after delivery in order to minimize the time during which deterioration can take place. Deliveries should thus be made to replenish the store serving current requirements and not the open-air store where each fresh delivery would be successively exposed to the effects of atmosphere and weather.

The reserve fuel, once it is laid down, should be disturbed as little as possible and may well remain there for several years.

In large buildings the amount of coal stored may amount to hundreds of tons, but individual stacks should not exceed 200 tons.

## Open Storage Bays

When a tipping lorry discharges its load on to the ground it deposits a roughly conical heap from 3ft. 6in. to 4ft. 6in. high. In practice, where there is no mechanical handling equipment and where labour is not available for manual handling, the limiting height of the stack is set by the size of the heap which a tipping lorry deposits ; *see* Fig. 8.

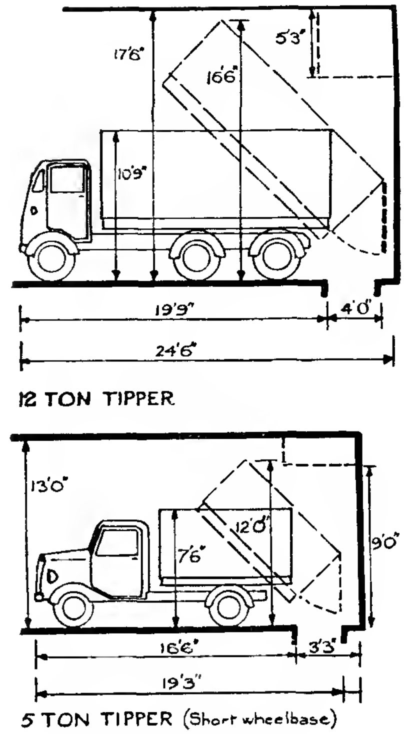
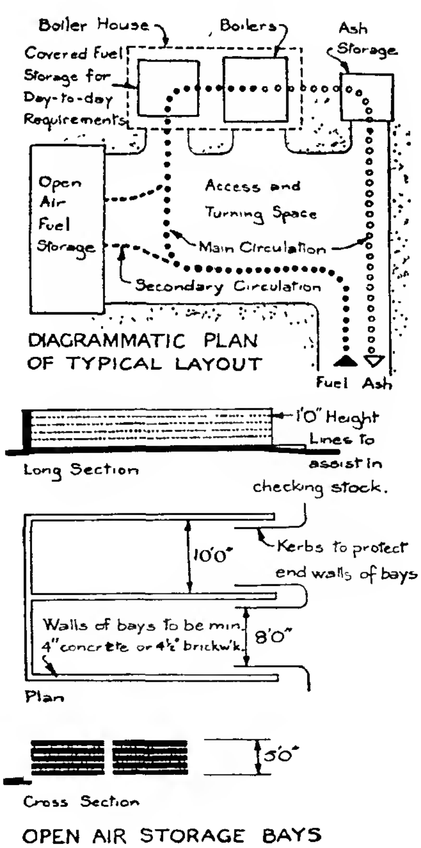



Fig. 7 Bulk delivery vehicles




Right: Fig. 8 Layout and dimensions for open-air fuel storage

### Space Required for Fuel Storage

The space required, weight for weight, for different types of fuel varies; the table below gives the bulk densities of different solid fuels.

### Mechanical Handling

It is doubtful if it is economical to install power-driven mechanical handling equipment for consumptions of less than 1,000 tons a year. The use of power-driven mechanical handling equipment is usually confined to large installations. There are two principal arrangements: the first, in which the fuel is transported from bunkers at low level by means of conveyors or elevators direct to the stoker hoppers; and the second, in which the fuel is conveyed by similar means to overhead bunkers, whence it moves by gravity to the stoker hoppers.

### Firing

The method of stoking again has an important influence on the way the fuel storage is arranged. All the normal types of heating boiler except large water tube boilers and, of course, magazine boilers, can be and frequently are fired by hand. It is possible in an emergency to hand-fire magazine boilers also. The tendency, however, is towards automatic stoking, either mechanically or by gravity, and in new buildings it is recommended that even if hand-firing is adopted, the storage arrangements are planned so that they will not prejudice the change-over to automatic stoking.

### Fuel Storage and Boilers

With hand firing, fuel should be stored immediately opposite the boilers. Where the bunkers are so placed that long runs with the barrow are unavoidable, an overhead runway with a travelling skip designed to deposit the fuel conveniently for the stoker may be advantageous. Where both fuel store and boiler room are at ground level it may be possible to arrange for delivery vehicles to back in and discharge their contents inside the fuel store. With basement storage the bunkers should be planned so that they can be filled through coal plates at ground level.

### Bunkers

Bunkers should be planned so that they can be easily filled and emptied and so that fuel flows by gravity from a filling opening at the top to an outlet at the base. They should be so designed that undue segregation, the separation of fines from the larger material, does not occur either in filling or during the passage of the fuel through the bunker. It is important to plan the bunkers so that the potential storage space available is fully utilized.

With bunkers which are filled through fuel openings in the top it is always difficult without hand trimming to ensure that the space is properly filled. With a single central opening a cone of fuel is formed leaving the corners of the bunker unfilled. A larger number of openings enable the bunker to be much more effectively utilized. It is common with bunkers in industrial buildings to leave the tops open, covered only by a metal grid, the mesh being determined by the size grading of the fuel used, and capable of sustaining the weight of vehicles. There is no difficulty in filling the bunker and segregation is minimized.

Where bunkers are designed to be self-emptying the bottoms should slope at an angle of not less than 45° with the horizontal. Where fuel is discharged on to an inclined chute—as for example from a delivery vehicle—an angle of 35° will be sufficient to ensure that the fuel is kept in motion. The minimum cross-section of such a chute should not be less than 10 times and preferably 20 times the size grading of the fuel. Bunkers should always be provided with access doors or manholes so that fuel can be trimmed. They should not be traversed by service pipes, cables or ducts.

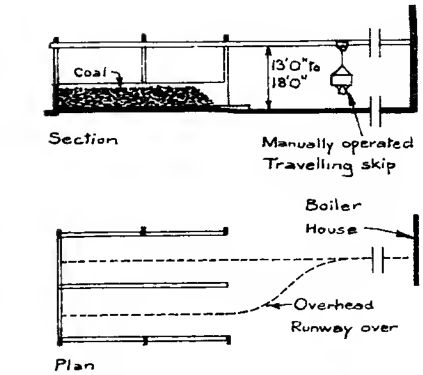



Fig. 9 Storage bays with overhead runway

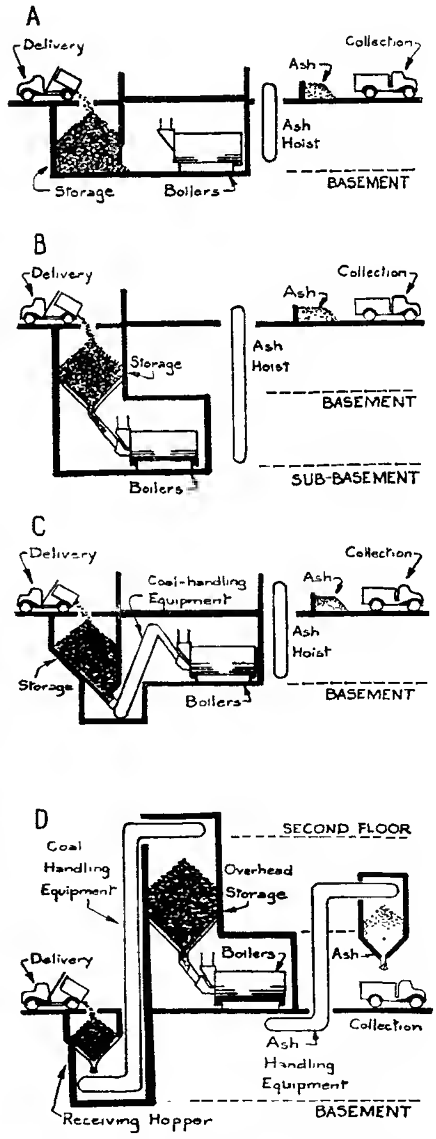



Fig. 10 Relationship of fuel storage to boilers

BULK DENSITIES OF SOLID FUELS

| Type of fuel (1) | Cu. ft. per ton (2) | lbs. per cu. ft. (3) | B.Th.U. per lb. (4) | Therms* per cu. ft. (5) |
|---|---|---|---|---|
| Anthracite | 41–37 | 55–60 | 14,500 | 8·0–8·7 |
| Bituminous Coal | 45–41 | 50–55 | 12,000 | 6·0–6·6 |
| Coke | 100–90 | 22–25 | 12,000 | 2·7–3·0 |

* 1 therm = 100,000 B.Th.U.

### Removal of Ash

Where ash cannot be handled mechanically it is recommended that it should be stored in bins. These may be either similar to the British Standard* dustbin or in areas where the local authority maintains a container service, large mobile containers. When bins of the British Standard type are used they should be small enough to be handled when filled with ash. Some existing buildings have been equipped with ash bins of heavy construction specially designed to withstand the effects of hot ashes and clumsy handling. In practice, however, they are too heavy for easy manipulation. It is suggested, therefore, that bins should be limited to 2cu. ft. in capacity.

A large number of urban authorities have a mobile container service which greatly simplifies the problem of ash collection. Containers are available in two sizes, 1¼cu. yd. and 2¾cu. yd., and provided by the local authority on an annual rental basis. They offer a much more compact method of storage than a large number of small bins. Their particular advantage is that ash is not disturbed when the container is transferred to the collecting vehicle.

For basement boiler rooms it will be necessary to install a hoist or other mechanical device for raising the ash to ground level. Where a hoist is provided it should be designed in relation to the receptacle which it will be required to lift. This may be an ash barrow, a portable bin or possibly a mobile container. With portable bins the hoist can be reduced to very small proportions. Two 2cu. ft. B.S. bins can be comfortably accommodated one above the other in a hoist with an internal size of 1ft. 9in. square. Mobile containers of 1¼cu. yd. capacity require a hoist with an internal size of 3ft. by 6ft. and with the gate on the short side.

Where road access can be arranged so that it is possible for collection vehicles to back close up to the hoist it will frequently be an advantage if the hoist is designed to deliver its contents on to a raised platform 3ft. 6in. above ground level so that bins can be passed directly on to the lorry. When ash is kept in bins, providing the lids are maintained tightly fitting, there is no objection to its being stored within the building. In urban buildings on expensive sites, where it is important to avoid encroachment on ground floor space, sufficient ventilated storage space should be provided below ground level and adjacent to the heating chamber. On open sites it will usually be more convenient to store ash out of doors. Where bins are used a small brick or concrete enclosure near to the heating chamber will assist in keeping them tidy.

* British Standard 792: 1947. Mild Steel Dustbins.

### Schools

Fuel consumption in new schools tends to be appreciably higher than in pre-war buildings, due to the requirements of the Education Act, 1944, particularly in regard to higher rates of air change and to improved standards of daylighting which necessitate increased glass areas. The estimated annual fuel consumption per pupil for schools built under the new Act is of the order of 7cwt. It may be noted that these figures are a considerable advance over the officially estimated pre-war national average† of between 2½cwt. and 3½cwt. per pupil. Some authorities aim to provide storage for a whole term, which enables deliveries to be confined to school holidays.

### Offices

Office buildings are usually in densely built-up areas where storage space is liable to be restricted and means of access difficult. Storage will normally be at basement level with access for deliveries through coal plates at ground level. Office buildings frequently occupy highly valuable sites and the cost of storage may be appreciable compared with the cost of fuel. For the consideration it may be deemed advisable to accept the risk of a somewhat reduced storage period. Some large commercial organizations overcome the difficulty by maintaining their own reserve fuel stocks sited in outlying areas. In the past the difficulty of obtaining suitable road access for bulk fuel deliveries was largely due to land being developed in small units which resulted in unbroken building frontages around the entire perimeter of island sites.

The movement towards redeveloping central areas on the basis of larger land units, in the interests both of better daylighting and of the more efficient utilization of space, will at the same time help to solve many urban access problems.

† Post-War Building Study No 27. The Heating and Ventilation of Schools published by H M S O.

### Flats

Before the war central heating and hot water was confined to so-called "luxury flats," but since then it has been seriously considered for local authority flats. In flats in high-density urban areas storage should preferably be under cover, either at basement or ground level in order to preserve the amenities of the layout. The boiler room will almost invariably be within the main block and fuel will necessarily have to be delivered close to the building. Access should always be arranged so that bunkers can be filled without nuisance to tenants whose windows may overlook the unloading point. It is an advantage if hatches or coal plates to bunkers can be arranged in or adjoining a north-facing end wall. The development of group heating in which a number of blocks is heated and supplied with hot water from a single central source means that considerable stocks of fuel will require to be concentrated in one spot. In addition to the greater thermal efficiency which can be achieved by this method, group heating by centralizing fuel storage and delivery enables bunkers and road access to be planned more rationally than when they are diffused among a number of separate blocks.

## Storage

### BOOKS FOR LOAN

#### General

The information given on book storage has particular reference to public libraries, but is also relevant to other types of libraries in other types of buildings.

The data are classified for loan and reference libraries and for their stack rooms and periodical rooms.

#### Dimensions of Stacks

Shelving in lending libraries is generally based on an allowance of nine volumes per foot run, and on the assumption of an average of eight shelves in the usual height of 7ft. 6in. But some libraries have limited the height of bookcases to 6ft. 6in., which is considered by some to be as high as the average person can reach or read the titles of the books. Also in many schemes the lowest shelf is placed about 18in. to 21in. above the floor. Some libraries have the two lowest shelves slightly tipped outwards to facilitate reading of lower book titles. As fiction accounts for some 65 per cent of the books in the average lending library, these are frequently arranged horizontally on the more central shelves of the bookcases.

Island cases must be at least 6ft. apart. 4ft. of space should be allowed between walls without bookcases and island bookcases, but this dimension should be increased to 6ft. if there are wall bookcases. A depth of 8in. should be allowed for all shelves for normal use, but some shelving having a depth of 10in. is generally necessary in some part of the library, and may very well be provided in cases placed against the walls. The length of shelves should be in units of 3ft. or 3ft. 6in. between vertical supports, which is the greatest length of shelf which should be used to guard against excessive sagging of the shelves under the weight of books, unless very thick wooden, or reinforced metal, shelves are used. Occasionally, however, shelves are extended to a maximum length of 5ft. between supports.

All shelves are generally made adjustable in height between the supports, although in a lending library this does not seem entirely necessary as allowance can be made for the few specially large books which have to be accommodated as well, and only a part of the shelving has, therefore, to be adjustable to accommodate them.

#### Position of Stacks

In some libraries, which are fed from a central library or stack room, it has been found that sufficient shelving can be obtained by the use of the walls only, without island bookcases. If wall cases only are used, the floor area of the room may be used for display tables, where special volumes, such as new books or works on special subjects, may be shown.

It is not general to provide any tables, chairs, or other facilities for reading in the lending library itself, as they occupy gangway space and are not used a great deal.

When island bookcases are used either with or without wall shelving, display cases, book troughs or shelves for new or special books should be planned in a prominent position in the room, either against the walls or as island fixtures.

#### Card Catalogue

The catalogue generally takes the form of a card index system using a card 5in. wide by 3in. high. The advantage of the card system is its unlimited means of expansion and interchangeability, thus permitting perpetual alphabetical order. The cards are held into the trays by rods passing through slots in the lower edge and screwed or locked into the drawer fronts. The card drawers or trays should be placed at a convenient height for handling by the reader of average height when standing and should therefore not be placed in too many tiers, as the use of one drawer in a tier prevents the use of the lower ones by other persons. It is advisable for drawers to be removable so that the maximum number of persons may consult the catalogue at one time and for that purpose slides are indicated in the front of the fitting shown in Fig. 11 and a shelf is provided on each side.

Writing space is needed on which application forms may be filled in. If the slides and side shelves are not provided, tables should be placed adjoining the card catalogue.

Some card catalogue drawers are placed on bases, which resemble ordinary tables, of the same width as the card drawers and which have sufficient clear space in front to stand the drawers on when they are removed from the cabinet.

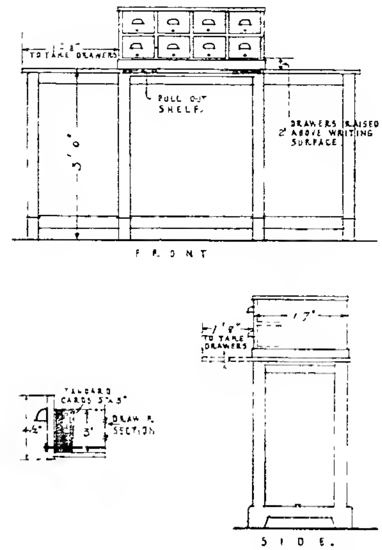



Fig. 11 Card catalogue fitting

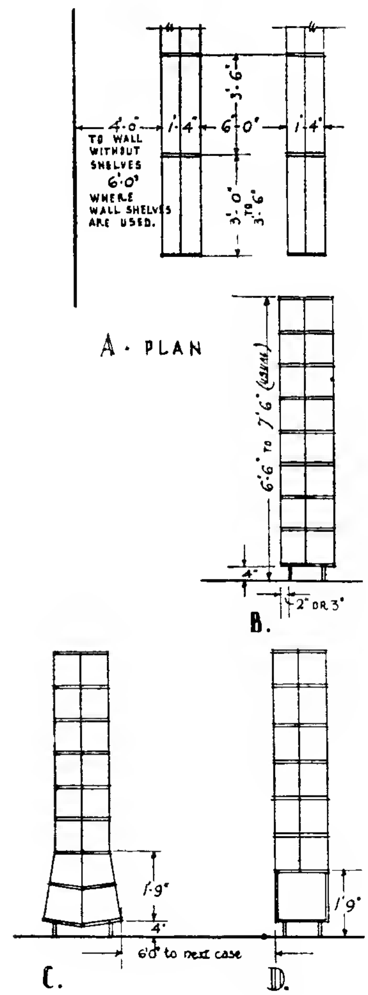



Fig. 12 Bookshelves

### Space Required for Books

Seven rows of books can usually be placed in the standard height of 7ft. 6in., and the following table is a general guide to the average number of volumes per foot run of shelving for different classes of books:—

| *Class of book* | *Vols per ft. run of shelf* |
|---|---|
| Bound periodicals .. | 5½ |
| Fiction .. .. | 9 |
| General literature .. | 8 |
| History .. .. | 8 |
| Law .. .. | 6 |
| Medical .. .. | 6½ |
| Technical .. .. | 7 |

Bound periodicals mostly require shelves at least 10in. or 12in. wide and some of them a little more. Many medical, technical and scientific books also need wide shelves. From the above table it may be assumed that the volumes in a lending library average 9 per foot run and in a reference library only 8 or slightly less; thus, a standard tier of shelves 7ft. 6in. high and 3ft. wide, when double-sided, will contain about 430 volumes in a lending library and 380 in a reference library.

### Weight of Books

Books weigh about 16lb. per lineal foot of 7in. shelf and metal stacks about 5lb. per cu. ft. of erected stack. The general loading for 7ft. 6in. high stacks should be assumed as 1½cwt. per sq. ft.

### Materials for Book Stacks

The book stacks are either made of metal or wood or a combination of the two. Metal shelving is becoming more general for stack room purposes, although some library committees prefer the appearance of wood in rooms used by the public.

### Book Stacks

It is the general practice to use stacks which are approximately 7ft. 6in. high; this permits access to all books by persons of average height without steps or ladders. The stacks are superimposed one on another, with a light flooring of stone, marble, glass or steel at each 7ft. 6in. of height. The stacks for storage purposes are generally of metal construction. Shelves are generally 7in. or 8in. wide, requiring an overall projection of about 9½in. from the wall for wall shelving and an overall width of 16½in. to 18in. for double-faced island stacks; it is necessary to provide for ventilation between two stacks of books placed back to back. The usual shelf length is 36in. and stacks are therefore made up as multiples of this dimension. For this purpose a 10in. shelf is generally sufficient. Large volumes such as folio and large quarto sizes should have special accommodation. All shelves should be adjustable. Most book stacks are normally designed for 7in. shelves but oversize shelves up to 10in. can usually be used in the same standards. Some stacks having approximately 12in. shelves are usually provided, giving 24in. overall width double-faced island cases.

A wire mesh division is usually placed between back-to-back bookcases to allow air to circulate, and to prevent books being pushed back into the wrong shelves.

### Access to Stacks

In stack rooms to which the public does not have access, the stacks may be up to 30ft. in length if there is access at both ends.

If access to stacks is available at one end only, 12ft. should be the maximum length of aisles.

Double cases should be 3ft. apart, although sometimes this dimension is reduced to 2ft. 6in., which is the absolute minimum in which a book trolley may be used with comfort. If the aisles are to be used for working purposes their width should be increased to 6ft. or 7ft.

Staircases leading from one stack level to another should have a width of at least 30in., or, if spirally constructed, a well of 4ft. 3in. overall diameter.

### Rolling Book Stacks

A desire to economize floor space has sometimes resulted in the mounting of each length of stack on rollers, on which it is moved into the gangway between the cases. By this method the stacks are placed against one another so that one gangway about 5ft. wide serves two rows of stacks, each 4ft. wide and 18ft. long.

### Ventilation

Provision must be made for continuous ventilation and movement of air to all parts of the stack room and also for the circulation of heat.

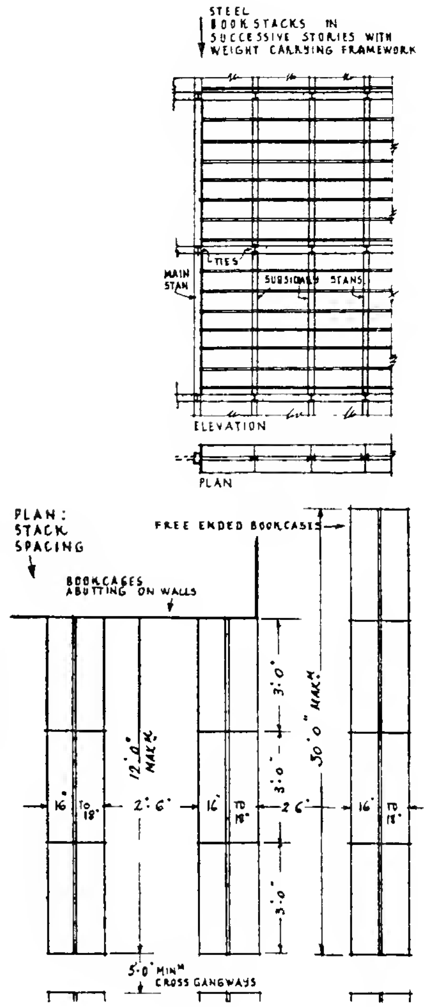



Fig. 13 Steel book stacks

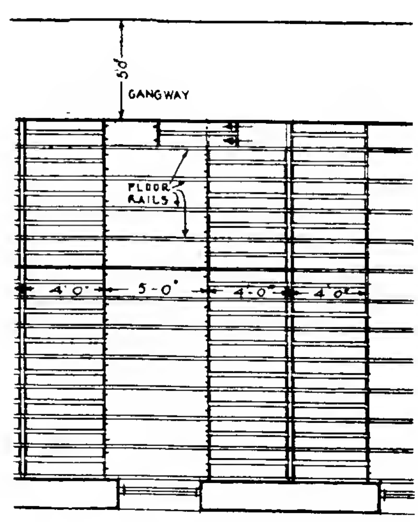



Fig. 14 Plan: Rolling steel book stacks

### General

The few general reference books which are required in a branch library are usually placed in a special bookcase in the reading room or occasionally in a case forming part of the staff working-space in order better to check the use of the books. Fig. 15 illustrates a typical fitting for standing in a reading room. This fitting is 5ft. wide, which it may be considered wise to reduce a little or to add one intermediate support as the reference books may be heavy. The height is about 6ft. 6in. overall, exclusive of the capping, in order that all books may be within easy reach of all likely users. The depth of the upper shelves should be at least 8in. and by the adoption of the scheme shown on the figure for the lower shelves, additional depth may be obtained, while at the same time the books are slightly tipped back so that the titles are more easily read. Frequently the lower shelf is placed about 1ft. 9in. above the floor level in order that readers should not have to bend down to read the titles or take out the books, but if space is limited to one small fitting of this type the full height is sometimes used as the books are only required occasionally. The shelves are all made adjustable by the use of one of the patent shelf supports.

### Materials for Stacks

Fittings are generally made of wood as they are part of the general decoration of the reading room and are consequently of a material similar to the remainder of the furniture, although sometimes metal construction is used.

### Layout

The layout of the room depends on table spacing, which in its turn is dependent on the number of persons seated at each table. It is now becoming general for these tables to seat four persons, two on each side, but it is better to have tables seating two persons only, one on each side, to give greater privacy. The older libraries use long tables seating eight or ten readers on each side, with a central screen dividing the readers on either side and sometimes low screens or divisions between each reader. The latter divisions give some privacy and ensure to each reader a fixed amount of table space. It is usual to allow about 6sq. ft. of table space per reader and a slight increase in area is advantageous to students who may require to refer to several books at one time, in addition to writing-space, ink-well, pen-tray, etc. The space between the sides of tables, although frequently only a few inches, should be at least 2ft., and between the writing sides of tables at least 5ft., which only leaves about 2ft. between chairs: this space should, if possible, be increased.

Ample space should be given round the reference case, and it is wise to plan a table or a wide shelf near it as some of the books, such as directories and dictionaries, are too heavy to hold with comfort. It must be borne in mind that there is continual passing and repassing of readers and staff carrying books, which must not disturb other readers, therefore plenty of space is required.

The main gangways should be 6ft. wide at least and subsidiary gangways should be 3ft. wide; but if they are against the walls of rooms they should be increased to 4ft. when there are bookcases against the walls.

When dual tables are used the spacing between tables should remain the same and therefore there is a saving in the floor area necessary. Tables are generally 6ft. long for two readers on each side and 3ft. for one reader, with a width of 4ft. for double-sided tables. The width is sometimes reduced to about 3ft., but a writing surface of 1ft. 6in. is not sufficient for study purposes.

Fig. 17 illustrates the main spacing required for the alcove type of table spacing. This layout is based on a bay spacing of 12ft. 4in., although this minimum is slightly variable, depending upon the material of the shelving and also the depth of the shelving. The latter may be made for the usual 8in. depth, or may be increased for part or the whole height to accommodate larger volumes. The clear space needed between the vertical faces of the shelving is 11ft. to accommodate double-sided writing tables with the necessary chairs. The length of the alcove from the outside wall is governed by the width required for a gangway between the wall and the table and the number of readers' spaces provided. The readers' spaces should be based on an allowance of 3ft. per person, although this is often reduced to 2ft. 6in. The gangway between the table and the outside wall should be at least 2ft. wide if the wall is not used for bookcases; but this should be increased, if possible, when there are bookshelves. The tables are generally designed to seat four or six persons. If they are larger, supervision becomes more difficult and also the general area of the reference room is likely to be too large, especially if other tables are placed in the centre or main part of the room and allowance is made in addition for a main gangway at least 6ft. wide and preferably much wider.

Fig. 18 shows the essential dimensions of a reference room table for two persons, one on each side. The table is 3ft. wide and 4ft. across, allowing for a central division or screen between the two readers, which also serves to lean open books against for reference. The tops are sometimes made sloping but are more usually flat. An ink-well is generally provided either in the top of the table or on a shelf on the central division. It is an advantage to have a shelf under the table-top on which to place extra books, a writing case, or an overcoat. A slide at the writer's left hand is very useful as extra table space.

Comfortable chairs should be provided, a fact which is often overlooked in libraries, as readers may be working in the library for a whole day or from day to day for a period of several weeks.

Fig. 19 is a more elaborate type of reference reader's table for four persons, two on each side. The table area allotted to each reader is slightly larger than previously, and in addition this type has the advantages of a division incorporating the desk lighting, the top cover of which also serves as a book rest. Lights are so placed that they give an intense light on the writing surface without shining into the reader's eyes while the general lighting of the room is sufficient for the lighting of the upper slope where books not actually in use are placed.

The essential factors of the design of reference tables are the provision of large areas for placing the books required by readers, which are often very numerous, and in all cases the provision of good light on the reading and writing surfaces of the tables.

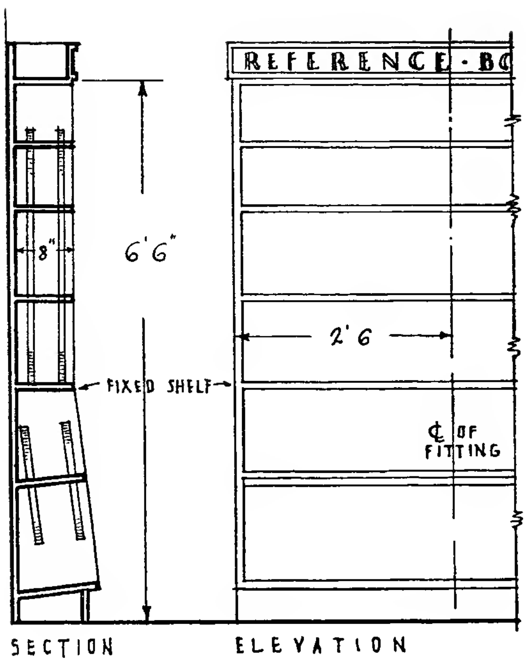



Fig. 15 Typical bookshelf fitting for reference books

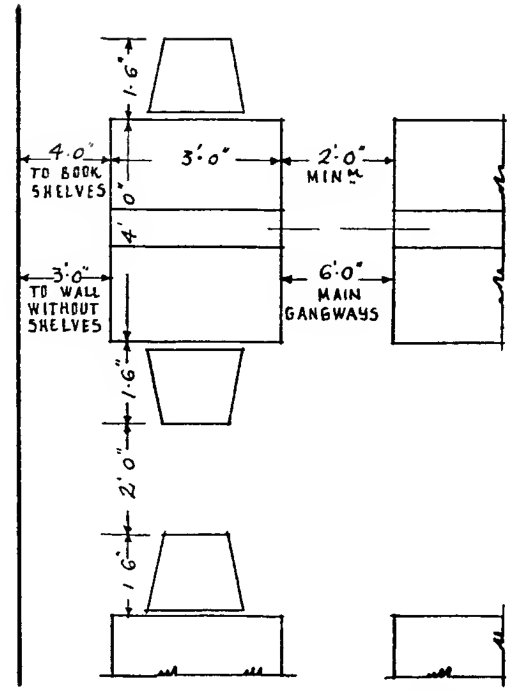



Fig. 16 Typical reference-room spacing

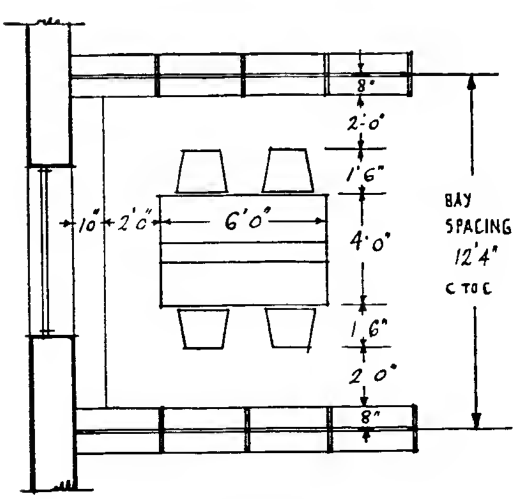



Fig. 17 Alcove type of table spacing

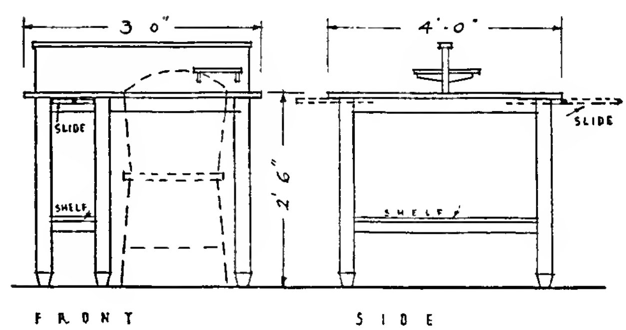



Fig. 18 Reference-room table for two persons

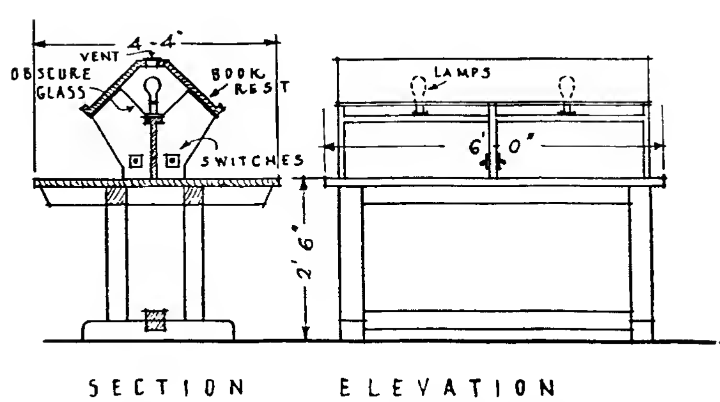



Fig. 19 Reference-room four-seat table with individual lighting

# Storage

## MUSIC, RECORDS, PRINTS, MAPS, LANTERN SLIDES, MICRO-FILMS, COMMERCIAL AND TECHNICAL BOOKS

### Music Libraries

Very many public libraries have music collections. The music may be bound in volumes for each instrument, but for loose sheet music for several voices or instruments which is to be lent as a set, binders seem the most efficient method of handling. The shelving for music is usually divided into short lengths of about 18in. between verticals as the bindings may not be very stiff and the volumes are generally thin and therefore difficult to handle.

### Gramophone Records

The lending of gramophone records appears to be an increasing service provided by public libraries; these records need very different handling to that given to books and therefore an open-access system is not generally adopted. The usual method is to provide a counter at which inquirers ask for individual items or even deposit a list; they call later or the next day to collect the records ordered. As the number of records in the library generally does not correspond with the heavy demand it is usual to instal display boards on which are clearly indicated those records available at the moment. Handling of records is slower than of books as they have to be carefully examined at the time of issue and again on return.

Storage of records generally takes the form of racking with vertical divisions having about ten or twelve records in each compartment; the records are stored in heavy paper covers or in albums when in sets. All racking should be based on the use of 12in. records: thus the spaces between horizontal divisions should be 13in. clear in height and the depth of shelves should be at least 14in. to allow for albums. Ten records in paper covers require a shelf length of 1½in. Racking should be very strongly constructed as the weights are heavy. It is suggested that the lowest shelf should be at least 2ft. above the floor; if three-tier shelving is used above, the overall height will then be about 5ft. 8in.

### Prints

Many libraries avoid collecting prints, engravings or photographs owing to the difficulty of storage and handling except when they are bound in volumes.

Smaller pictures can be mounted on uniform sized cards and may be filed in a large size vertical-filing cabinet, in which form they are easily handled and do not suffer much damage. Larger pictures have to be stored flat either on shelves or in horizontal-system box files to prevent damage; such pictures should be mounted on one of about three standard-sized mounts which can be placed in large chests of drawers similar to plan chests, or they may be laid on flat shelves which slide out; both methods, however, are liable to damage the pictures owing to pulling one mount across the face of another drawing or print. Vertical filing similar to that now used in some drawing offices might also be considered; vertical filing may be either of the suspended type or similar to a very large card index; in either type the risk of damage seems likely to be less than when a horizontal system is used. Some libraries also use box files for small maps, prints and drawings.

### Maps

Most reference libraries have to stock a number of maps, and these may be treated in any of the ways suggested above for prints. Some libraries roll up maps and store them in tubes which are placed in racks having vertical and horizontal divisions at 9in. to 12in. intervals; this method is unsatisfactory, as any paper that has been rolled is difficult to consult.

### Lantern Slides

Some libraries now make and keep collections of lantern slides. The usual method of storage is in cabinets of drawers of the correct size for the slides; the drawers should not be too deep and not more than two slides wide, as slides are heavy and the drawers, if large, become difficult to handle. A card for each slide is usually put in the drawers recording the correct position of each slide, together with its number and classification, both of which are also marked on each slide.

### Micro-films

The provision of proper storage for micro-films is becoming of great importance in many libraries. It is desirable that acetate film be used and not nitrate film as there are inherent dangers in the latter. Films for storage may be of two types, strips in rolled form or short strips in flat form. The rolled types should be stored, if the stock is sufficiently long, in circular containers which are usually 4in. in diameter and 1¾in. high which hold up to 100ft. of film; if the stock is in short lengths the containers are usually 1½in., 2in., or 3in. square on plan and 1¾in. high. Cabinets with shallow drawers or trays based on multiples of 4in. in both directions and about 2in. high in the clear have been found to be satisfactory as a means of providing easy access. Short lengths of flat film are stored in either horizontal or vertical layers in standard filing cabinets.

The important factor in the storage of micro-films is to maintain even humidity; this may be achieved either by keeping the whole room at about 50 per cent of humidity at average room temperature (about 60° F.) or by the use of special humidified cabinets.

Facilities for micro-film readers are becoming increasingly necessary in larger libraries. The reading-instruments are of several sizes, ranging from about 1ft. 6in. square on plan (about 2ft. 9in. high overall) to about 2ft. 9in. square (about 3ft. high); they are usually placed on special tables or desks, at normal sitting-height, so that both can be used easily by the personal reader. The larger instruments are sometimes mounted on stands, containing racks or shelves in the lower part, of a height for use when standing. If a number of instruments is installed, a special room for microfilm reading is probably a necessary part of the accommodation of a large library. If the precise locations can be determined beforehand, electric floor-plug outlets are best.

### Commercial and Technical Books

The books to be housed are standard technical, quick reference and encyclopædic works, together with official pamphlets and reports, news-cuttings, catalogues and price lists. They are accommodated in normal shelving of suitable sizes, but some of the other publications, such as news-cuttings and catalogues of all shapes and sizes present storage difficulties; catalogues seem to be dealt with most satisfactorily in box files, which can be placed in shelves either horizontally or vertically, the former being better in many ways, as loose sheets are less liable to damage. Fig. 21 illustrates two typical methods of shelving for box files. Adjustable shelving is the most useful, especially for vertical filing,

in that different sizes may be placed in one set of shelves. When horizontal files are used shelves should be placed at frequent intervals as all but the top file on each shelf are difficult to remove; it is suggested that three box files, one on the other, are the maximum number that is practical.

Commercial libraries also need ample display and storage space for periodicals. An important factor to be borne in mind in the design of the periodical stacks in commercial libraries is that reference is very frequently needed to back numbers during the interim period between issue and binding, and for that purpose a special type of shelving is suggested as shown. The idea of this shelving is that the current issue of each paper is shown on a rack which forms a cover to the shelves on which are placed past numbers until such time as they are removed for binding. This system keeps the back numbers reasonably clean and free from dust, saves the staff much time in turning up back numbers needed by inquirers and occupies comparatively little space.

### Children's Reading Room

This is usually a large room with wall bookcases on two or three sides and one wall left for use as a lecture screen. The piers between windows or similar wall spaces are useful for the display of notices, pictures, etc. The centre part of the room should be devoted to tables and chairs. The tables are best if only seating four children. A suitable size is 30in. by 52in., or 3ft. 6in. square, the former seating two children on each long side. Some circular tables are often used to vary the general appearance of the room and give an atmosphere completely different from that of the children's school rooms. Table tops should generally average 25½in. above the floor and chair seats 14½in. The bookcases should be against walls so that supervision is made easy and children cannot hide behind projecting or island cases. Cases should not exceed 5ft. 6in. to the centre of the topmost shelf containing books. Fig. 20 illustrates the furniture dimensions suggested and also the relation of table positions to the surrounding walls and to each other. Ample space is needed between the tables and wall book shelves because the children often stand for a long time considering what books they will take out.

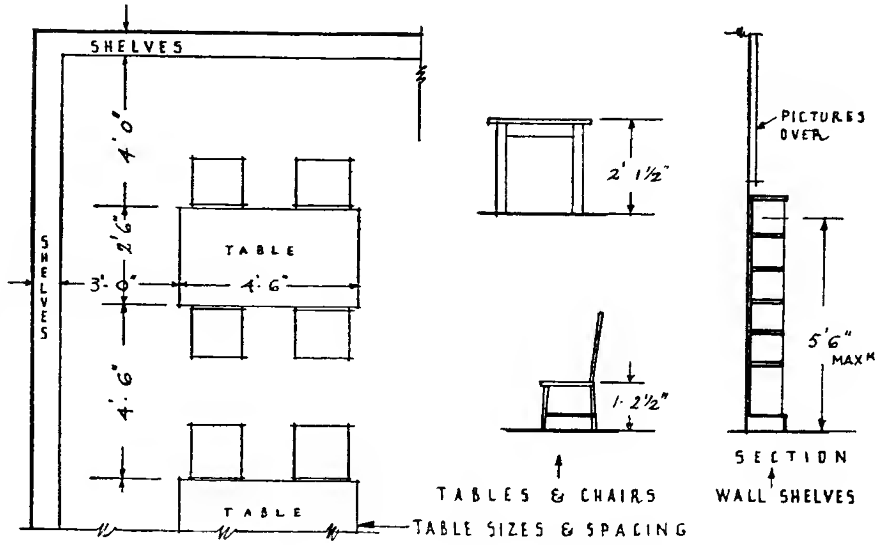



Fig. 20 Children's furniture

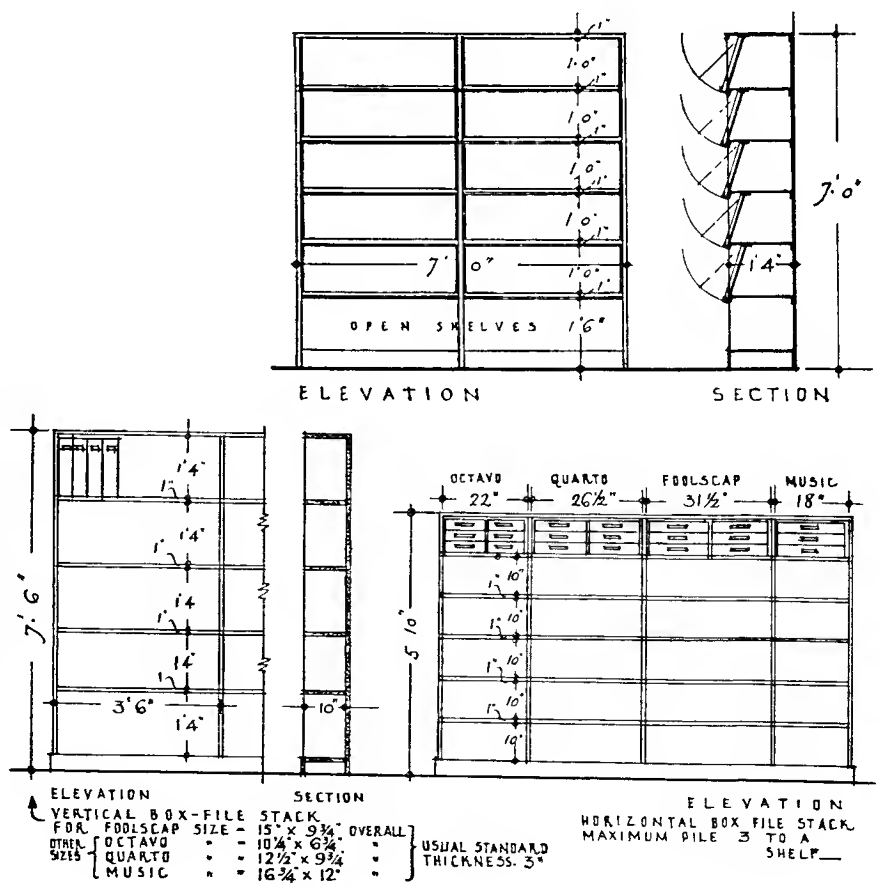



Fig. 21 Method of shelving for box files

# Storage

## PERIODICALS

### Layout

The display of daily and weekly newspapers is general in most branch libraries. The most satisfactory method of display seems to be upon wall stands rather than on island stands as supervision of the room by the staff is thus made easier and the room has a less crowded appearance. Smaller libraries often combine the newspapers with periodicals and by such arrangement the walls are devoted to the newspaper stands and all the centre part of the room to periodical reading tables. The stands are generally made with sloping faces projecting 15in. to 18in. from the wall or from each side of the centre line of the stand. If the slope is too flat the upper portions of the pages are difficult to read. The stands are either designed of such a height that readers may sit while reading or such that readers must stand.

### Dimensions

The general dimensions required are indicated in Fig. 22. Each paper requires an area of about 4ft. in length and 2ft. 6in. in height. The usual heights of the lower edge of the slope are 3ft. from the floor for standing readers and 2ft. 4in. for seated readers. A protection or leaning rail or bar of metal is sometimes fixed at the lower edge of the slope to prevent readers from leaning on and tearing the papers. The newspapers are fixed to the slopes by various patent locking bars. The titles of the papers should be displayed over each stand in lettering easily legible from all parts of the room.

Racks for newspapers are frequently formed of fixed shelving to give spaces 3ft. wide, 3ft. high and 3ft. deep, in which the filed papers are placed in fairly considerable numbers as frequent reference to them is unusual.

Large folio volumes generally need to be kept flat as the leaves and bindings suffer damage if they are placed vertically. The shelves on which they are placed should draw out. The dimensions of the cases vary considerably in size but a good general rule is to space the vertical divisions 3ft. apart and use seven shelves in a height of 4ft.; the depth needed is from 2ft. 6in. to 3ft. It is general not to make these fittings very high in order to provide a reading slope on the top of the fitting at about 4ft. above the floor level.

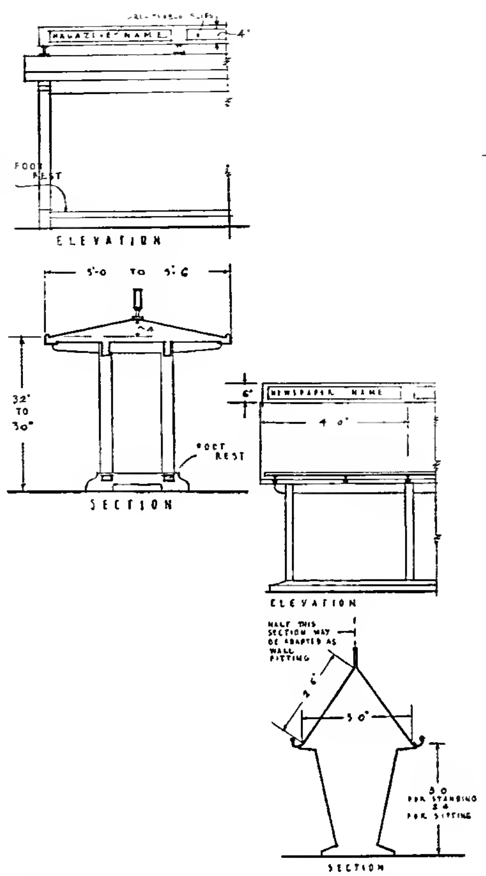



Fig. 22 Magazine table: Newspaper stand

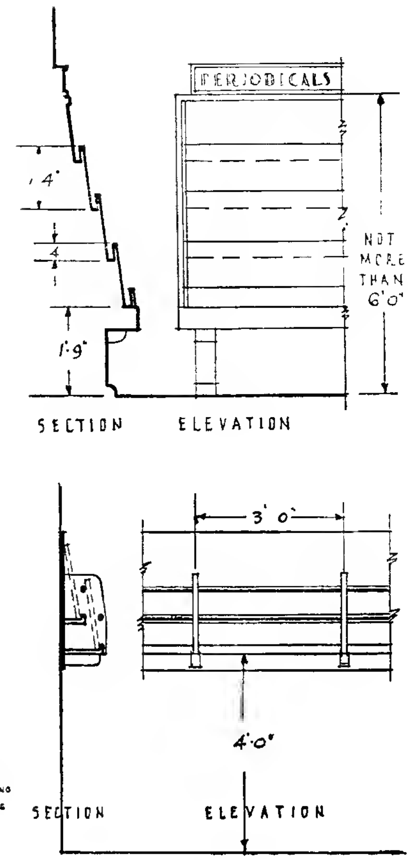



Fig. 23 Periodical racks

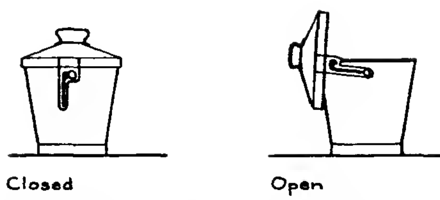
Magazine tables are generally 30in. to 32in. high above the floor level; tops may be flat or slightly sloping. The name boards should be designed so that the name slips can be interchangeable behind glass fronts. The name boards also act as a screen and reduce the tendency to indulge in conversation across the tables.

The use of periodical racks against the walls or as independent fittings instead of the table racks is on the increase as more papers can be accommodated, and readers may sit where they wish.

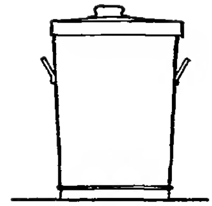
In some libraries only single or double shelf racks are used. The lower shelf is placed about 4ft. 6in. above the floor, and the rack may be continuous for the whole length of the wall or walls on which it is placed as long as supports are placed at about 3ft. intervals. Solid shallow fronts or rails are necessary to hold the books in place. An alternative type is made in widths to suit the spacing of bays or piers between the windows of the building. If, however, the width is greater than 5ft. a centre division should be introduced to support the shelves and racks against which the magazines rest. The lowest shelf carrying the magazines should be at least 1ft. 9in. above the floor, and the overall height should not be more than 6ft. above the floor level. The shelves which carry the papers are placed behind one another and at a slightly lower level than the top of the support to the row in front. Thus an extra tier may be introduced in the normal height of the display surface. The spacing of the shelves may be varied considerably, but it must be remembered that some of the periodicals are quite large especially when enclosed in a stiff cover.

Other equipment of periodical rooms consists of lists of papers taken and sundry notices for the information of visitors. Such lists and notices should have permanent positions in fixed frames incorporated in the general decorative scheme, but the frames to contain the slips or notices must be capable of rapid and easy changing.

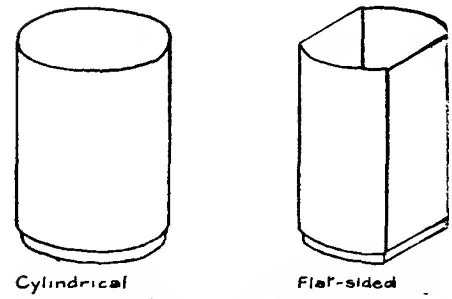
CONTAINERS, CHUTES




MILD STEEL REFUSE OR FOOD WASTE CONTAINERS

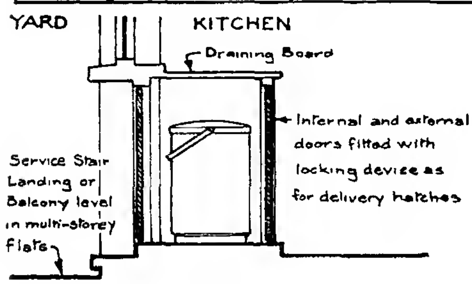


MILD STEEL DUSTBINS

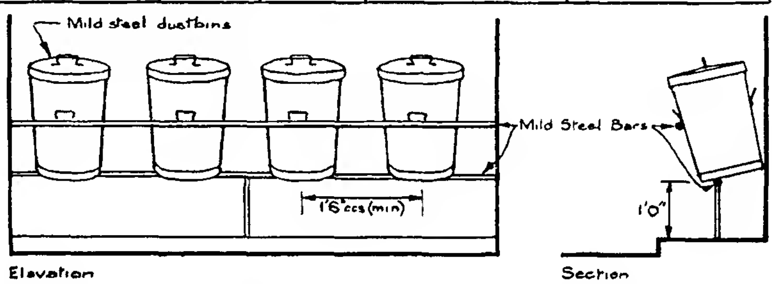



MILD STEEL REFUSE STORAGE CONTAINERS

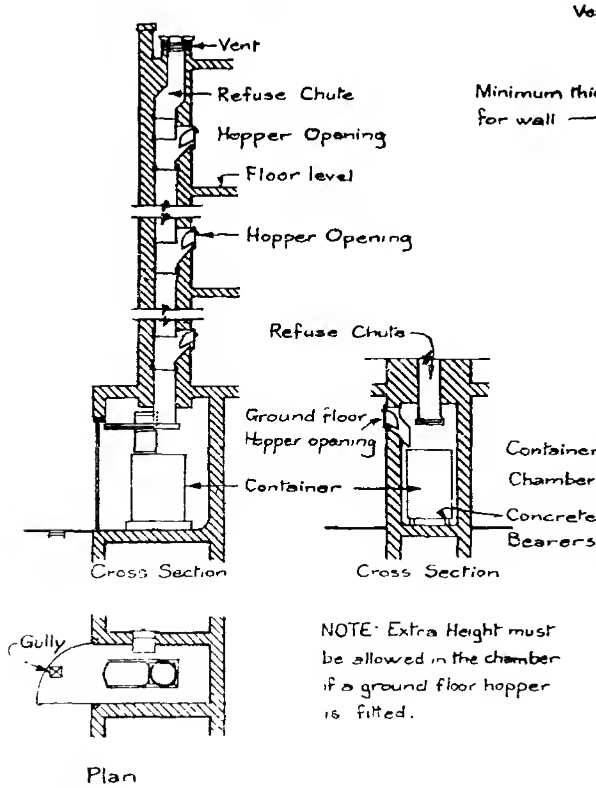
| TABLE OF SIZES | M.S. REFUSE OR FOOD WASTE CONTAINERS | MILD STEEL DUSTBINS A | B | C | D | M.S. REFUSE STORAGE CONTAINERS Cylindrical | Flat-sided |
|---|---|---|---|---|---|---|---|
| Nominal Capacity | 0·5 cubic feet | 1 cubic ft. | 2 cubic ft. | 2½ cubic ft. | 3¾ cubic ft. | 1¼ cubic yards (34 c. ft.) | 1 cubic yard (27 c. ft.) |
| Internal Diameter | 8½" bottom 11¾" top | 12" b. 14" t. | 14" b. 16" t. | 15" b. 17" t. | 16" b. 18" t. | 3'0" | 3'0" (2'6" across) |
| Maximum Width | 13¾" (closed) | 18" | 20" | 21" | 22" | 3'3" | 3'5" (2'6½" across) |
| Internal Height | 10½" | 14" | 20" | 22" | 24" | 4'3" | 4'3" |
| Overall Height | 15½" | 18" | 24" | 26" | 28" | 4'4" | 4'4" |
| Net Weight | 5 lbs. 12 ozs | 13 lbs. | 20 lbs. | 23 lbs. | 28 lbs | | |



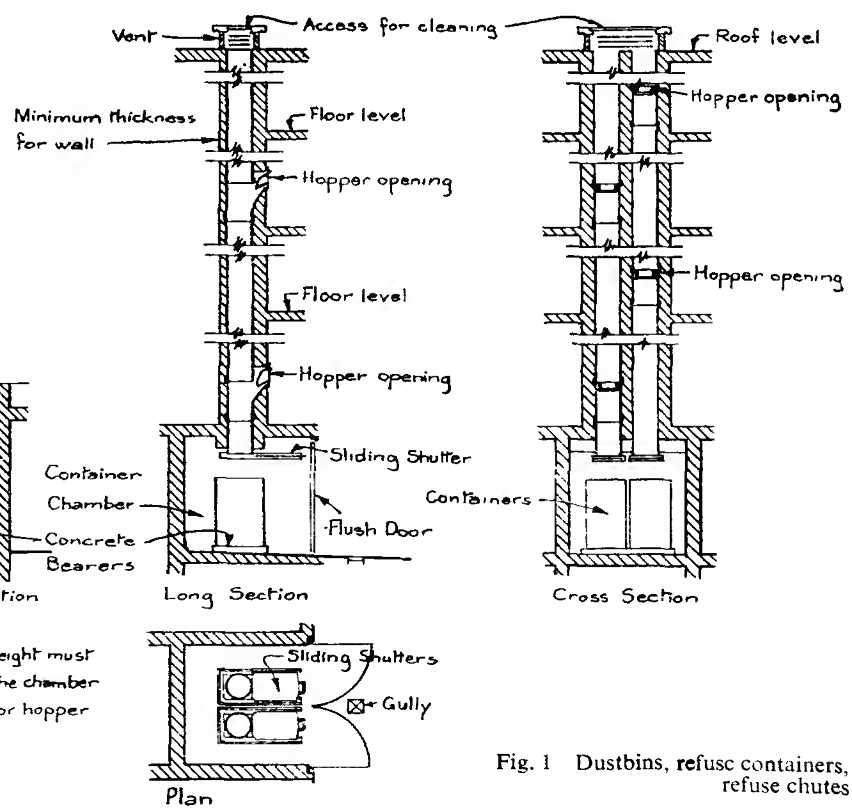

TYPICAL "BINETTE" HATCH




TYPICAL DUSTBIN RACK FOR USE IN CATERING ESTABLISHMENTS




TYPICAL SINGLE REFUSE CHUTE




TYPICAL DOUBLE REFUSE CHUTE

Fig. 1 Dustbins, refuse containers, refuse chutes

# PART TWO

**Information applicable to specific building types**

## General

The term "housing" is intended primarily to refer to dwellings for letting. It is appreciated, however, that the types of dwelling are basically the same for a large proportion of the houses sold through long-term mortgages with building societies and similar agencies. Additional requirements for the house for the individual client are given at the end of this section.

An important consideration which has to be borne in mind in the planning of "housing" as opposed to "houses" is that the tenant or occupier is individually unknown and, therefore, the planning must be concerned with providing the best possible solution for the probable needs of an average family in the particular area in which the dwellings are to be built. A further and more difficult factor is the need to anticipate as accurately as possible future trends, since many of the houses may be financed by long-term loans, the periods of which may be as long as 60 years in order that the rents may not be unduly high. Cost is undoubtedly a factor which is always before the designer of housing so that rents or selling prices should not be unduly high; to this must be added the need to design, construct and equip housing in such a manner that maintenance costs are kept to a minimum, a factor which reacts not only on rents but also makes for general convenience to tenants.

These notes will not be found always to conform with official instructions to local housing authorities, as political and economic needs may dictate temporary requirements which are not wholly compatible with good planning; this section also covers the requirements of other than state-assisted housing within the field defined above.

The problems of housing are divided into certain essential categories of building, such as houses in urban and in rural districts for which the planning considerations should be quite different, and houses for specialized tenants such as miners, rural policemen, smallholders, and old persons.

## Legislation and Publications

There has been much legislation covering the field of housing. Local authorities were empowered in 1851 to provide houses. Since then there have been many official publications on this subject and there are a number to which it is desired to make special reference, as these have to be accepted as the official directions for these types of dwelling. These publications are:—

1944, "Planning Our New Homes," Department of Health for Scotland (H.M.S.O., 3s.).
1944, "Design of Dwellings," Ministry of Health (H.M.S.O., 1s.).
1944, "Private Enterprise Housing," Ministry of Health (H.M.S.O., 1s.).
1944, "Housing Manual," Ministries of Health and Works (H.M.S.O., 3s. 6d.).
1949, "Housing Manual" (revised), Technical Appendices (H.M.S.O., 2s.).
Supplements;
1951, "Houses for Special Purposes" (H.M.S.O., 2s.).
1952, "Houses, 1952" (H.M.S.O., 3s.).
1953, "Houses, 1953" (H.M.S.O., 3s.).
1956, "House Design," Department of Health for Scotland (H.M.S.O., 4s. 6d.).

## Size of Dwelling

Housing has to provide shelter for individuals or groups varying in numbers from one person upwards, in the form of living and sleeping space; together with facilities for cooking and for washing, and for services such as heating, to insure at least minimum comfort. The Housing Act of 1935 requires a minimum bedroom area of 70sq. ft. for one person and 110sq. ft. for two persons, and this was consolidated in the Housing Act of 1936 which was again consolidated in the Housing Act of 1957, of which it is the sixth schedule of Section 77. This bases the number of persons to be accommodated in any dwelling on the number of bedrooms provided. It should be noted that the accommodation is based on bedrooms, excluding all living rooms. Two children under ten years of age count as one adult. Thus a dwelling with two bedrooms accommodates four persons, three bedrooms five or six persons, depending on the size of the third bedroom, and four bedrooms seven persons, assuming that one room is small.

Fig. 1 shows the percentage of families of various sizes in England and Wales in 1931 and 1951; from which it will be noted that houses with two bedrooms provide adequate accommodation for 50 per cent of the population, namely, those with three or less in a family. The average family in 1951 was 3·21 persons. In the inter-war years the greater proportion of the dwellings built in Scotland had two bedrooms, and in England and Wales three bedrooms. The larger number of bedrooms built in England in relation to the actual family need was due to a variety of reasons and it is likely, for the same reasons, that this size of house will continue to be that most in demand and will best meet the needs of the bulk of the population.

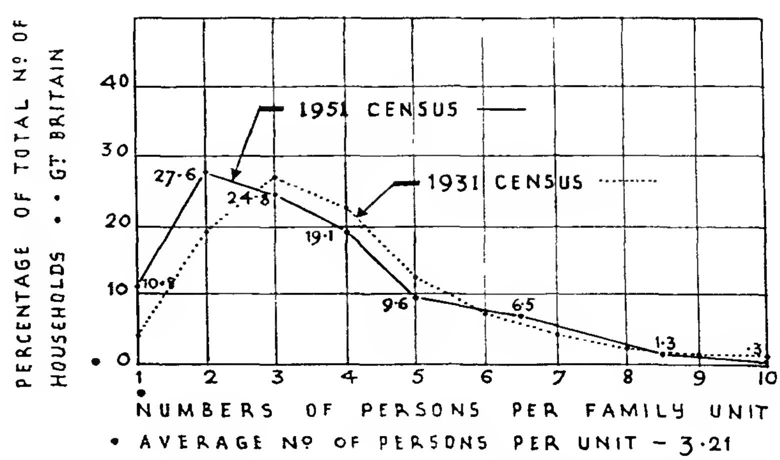



**Fig. 1** Family units, 1951

## SITE PLANNING, GATES, FENCES, ROADS AND PATHS

### Site Planning

The authors are of the opinion that site planning, since it must of necessity include much which is not housing alone, is outside the scope of this section. The following short paragraphs, however, draw special attention to some matters which, although they deal with site planning, are also very closely related to the planning of the dwellings themselves.

### Playground Spaces

It is very desirable that suitable spaces in close proximity to dwellings should be set aside as playgrounds to eliminate the need for children to play in the streets. Playgrounds may, with advantage, be of irregular shapes. Sites should be such that the need to cross main roads to reach the playgrounds is avoided. Information on the planning of playgrounds is given in Part 1: Recreation.

### Trees and Shrubs

The value of tree and shrub planting to assist the setting of an estate is often overlooked. The cost in relation to the effect obtained, after a few years of growth, is relatively small. Trees and shrubs may be planted either in groups or singly in rows in the verges or in the forecourts. Expert advice should be sought in regard to the varieties to be planted to avoid those which grow too large and cannot be pruned satisfactorily, and also to ensure varieties suitable to the local soil conditions. Planting serves not only for pleasant appearance, an aid to privacy, and as wind protection, but is also a useful contribution to the reduction of traffic noises.

Full use should be made of all existing trees on sites, so long as they are not of an age or type likely to be dangerous to closely-adjoining buildings. Equally, use should be made of existing hedges when these are in a condition which will allow them to be trimmed and gaps to be filled, with a good expectation of development into a satisfactory hedge at not too great an expense. The use of existing trees and hedges tends to remove more quickly the feeling of newness on an estate and reduces the period of waiting for new planting to grow up.

### Gates, Fences and Forecourts

The development of the space between houses and the public footpath is somewhat controversial; it may either be used as a private front garden separately fenced and maintained by the individual householder, as a single communal garden maintained as a complete unit or as one unfenced space in which each householder has a flower-bed adjoining his house, but the remainder is communal, usually in the form of grass, with tree and shrub planting as needed. Private gardens tend to give an untidy appearance to an estate even if well looked after (which is not always so), due to the varied treatment of the space allotted to each tenant, whereas communal gardens are likely to be more homogeneously designed and are maintained as a whole.

Dwarf walls, fences or hedges should be used, if private gardens are adopted, in preference to high fences, although these do not prevent children or dogs from entering gardens; low walls are apt to be attractive playgrounds for children unless backed by hedges or designed with rounded or shaped tops. When communal gardens are used it is essential that they be maintained by the estate or local authority. It is quite usual to find the front garden used for flower growing and the back garden devoted almost entirely to vegetable production. Back gardens should be separated by fences which should be of a type which dogs cannot get through or over; hedges, after a few years, take away too much of the fertility from the parts of the gardens adjoining them, but if they are used, it is essential during the period of growth to provide some form of temporary fencing such as concrete posts and wire mesh 3ft. 6in. high (see B.S. 1722); horizontal wires between posts alone will not keep out children or animals.

It is customary in many areas to provide an 8ft. to 10ft. length of wall or close-boarded fence about 6ft. high from the line of the rear of the house and also between houses where side entrances are planned, in order to give additional privacy to the back of the house. Paths in gardens should not be less than 3ft. wide and it is desirable that the width be increased adjoining back entrances to provide a small dry-paved area of about 150sq. ft.

It is advantageous to provide a path for a considerable length of the back garden for access to the clothes line, as its lack has frequently been the source of much complaint. Care must be taken that all paths have sufficient cross-fall to ensure drainage. (For types of fences, *see* Part 1: Sites.)

### Roads and Paths

Roads should not be less than 13ft. wide, so that two vehicles may pass easily. Normal estate roads should be 16ft. wide, but if they are long or likely to have a considerable amount of traffic the carriage-way should be 22ft. wide. Turning spaces at the ends of culs-de-sac should not be less than 40ft. in diameter. The planning of narrow estate roads with " lay-by " lengths of greater width to permit vehicles to pass one another is not very satisfactory in practice; lengths of widened carriage-way in which cars may be parked are however, very useful, and such increased widths should be 6ft. 6in., and should be in lengths which are approximately multiples of 12ft., with a minimum of 24ft., as effective length is lost at each end of the space. Footpaths should be at least 6ft. wide. If grass verges are to be used, widths of less than 6ft. should be avoided, as the grass becomes so damaged that it is impossible to maintain it in an orderly condition; care should be taken to provide a sufficient number of paved crossings. Verges of less width should be paved, avoiding materials strongly contrasting with that of the paving of the footpath itself. (*See also* Part 1: Transport for the dimensions of cars, motor-cycles, bicycles, garages and turning circles.)

### Aspect

There is general prejudice against plans which do not provide the kitchen and scullery at the back or side of the house, and the second living-room, if provided, at the front and near the front entrance. It is by no means impossible to meet these desires and at the same time give reasonably good aspects to all the main rooms, but it is essential to change plan types to meet differences of situation in relation to the road access. It will be found that roads which are planned directly east and west are the most difficult to handle, especially in regard to the houses on the south side of the road. Main living-rooms should have sunshine for at least part of the day, whether they are designed to be used as living-rooms only or as kitchen-living-rooms. Sculleries and larders should have north or east aspect. In the design of large blocks of flats it is generally desirable to plan with the main axis of the block from north to south, so that sunshine reaches all rooms at some time during the day. Fig. 2 is a diagram showing the hours during which sunshine is available for different aspects during the day at varying times of the year. The important factor is the low angle of the sun at noon in mid-winter, as this influences the spacing between buildings or blocks of buildings. Indicated on the perimeter of the diagram are also recommended aspects for different types of room. It is important that kitchen-living-rooms should be treated basically as living-rooms and not as kitchens, although full south-westerly aspects may prove to be somewhat hot in summer-time.

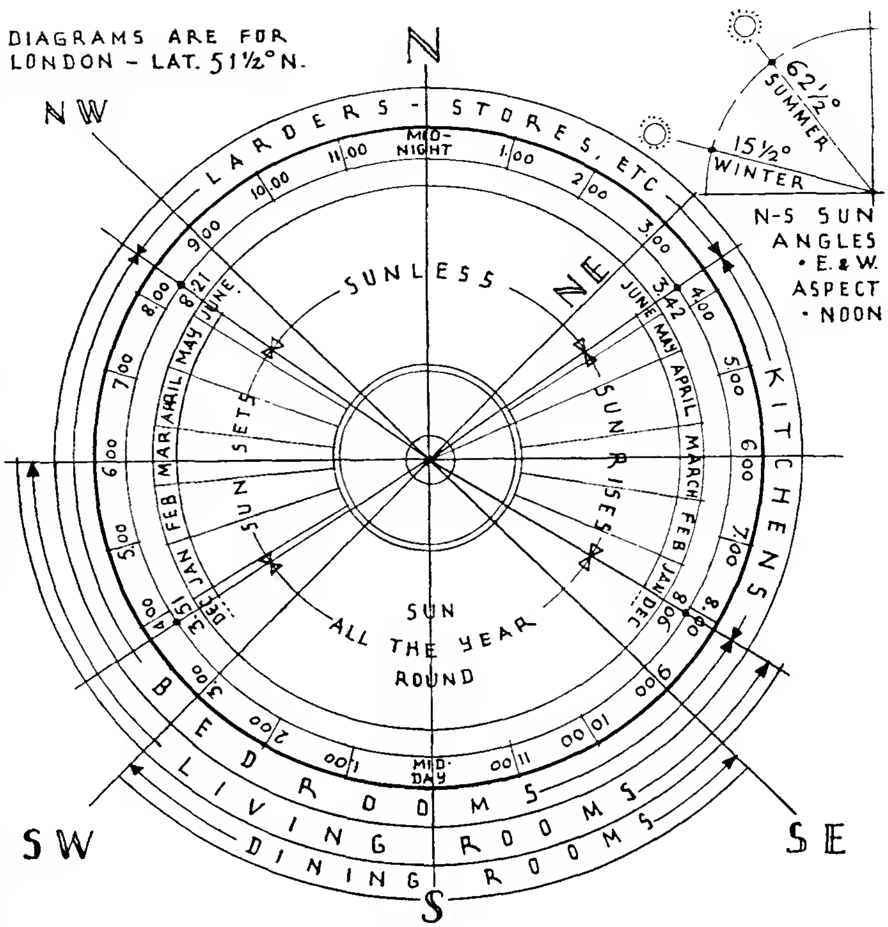



Fig. 2 Recommended aspects in relation to the sun

### Daylighting

The important consideration in the provision of adequate daylighting is not only the size of windows, which is at the moment regulated by by-laws, but also site planning, with such spacing apart of rows of houses or blocks of flats as to ensure that sunshine is not cut off in the winter-time. Reference should be made to the Report entitled "Lighting of Buildings" (M.o.W., Post-War Building Studies, No. 12, H.M.S.O., price 2s. 6d.), in which the whole problem is thoroughly discussed and very full recommendations made, although in some respects these may be considered a little idealistic in regard to the spacing of buildings in urban areas. Reference can also be made to B.S.C.P. 3, Chapters I (*A*) and I (*B*).

### Daylighting Code

Planning authorities are now using the daylighting tests for the design and layout of buildings set out in "Redevelopment of Central Areas", 1947 (H.M.S.O.). This handbook relates the methods and tests to non-residential zones, but many authorities with administration over high-density areas are using an application of the code for residential zones. The code sets out to ensure that enough daylight reaches the lower walls of buildings to enable rooms to be lit with normal-sized fenestration. The latter is, of course, different for dwellings and for other buildings and special "indicators" or protractor devices are used which allow for these differences: those given, therefore, in the above-mentioned handbook will not apply for residential planning; the latter are given in Appendix 3 of "Density of Residential Areas", 1952 (H.M.S.O.). Two sets of "indicators" are used, one for the design of buildings affecting each other on the same site and one for determining the effect of buildings external to the site. The latter set is used from the centres of streets or the lines of site boundaries where there are no streets. Certain anomalies arise in the use of these code indicators and they must be used with due regard to other factors, such as the effect of aspect and sun angles. Designers are advised to ascertain the requirements of local authorities in these matters, as methods vary in different localities.

# Housing

## SITE DIMENSIONS, GROUPING, NOISE

### Site Dimensions

The number of houses to the acre may be defined by the development plan of the area under the Town and Country Planning Acts, and usually has to be interpreted into plot sizes by the architect when considering whether detached or blocks of houses are to be used. The table gives the depth of each plot, together with the frontage provided for various numbers of houses per acre.

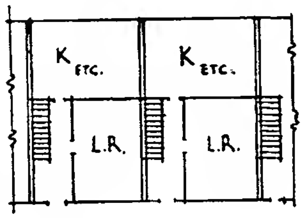
It should be borne in mind that half the width of roads up to a maximum of 20ft. may be included for the purpose of calculating acreage, site cover and the number of dwellings.

It should be realized that narrow frontage layout, although more economical in length of roads, paths and main services, is not necessarily the most economic development of every site, since deep sites may be wasteful of land.

It is desirable that sizes of garden should vary throughout a housing scheme, as some tenants prefer small gardens and others large gardens. Some allotments should be available reasonably near all houses, for the benefit of keen gardeners.

FRONTAGE OF RECTANGULAR PLOTS OF DIFFERENT DEPTHS

| *Houses per acre* | *Depth of plots (ft)* | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 100 | 120 | 125 | 130 | 135 | 140 | 145 | 150 |
| 6 | 72·6 | 60·5 | 58·08 | 55·83 | 53·6 | 51·83 | 50 | 48·4 |
| 8 | 54·43 | 45·37 | 43·56 | 41·875 | 40·25 | 38·875 | 37·5 | 36·3 |
| 10 | 43·56 | 36·3 | 34·84 | 33·5 | 32·2 | 31·1 | 30 | 29·04 |
| 12 | 36·3 | 30·25 | 29·07 | 27·91 | 26·83 | 25·91 | 25 | 24·2 |
| 15 | 29·04 | 24·2 | 23·23 | 22·3 | 21·46 | 20·73 | 20 | 19·36 |
| 20 | 21·78 | 18·15 | 17·42 | 16·65 | 16·1 | 15·55 | 15 | 14·52 |



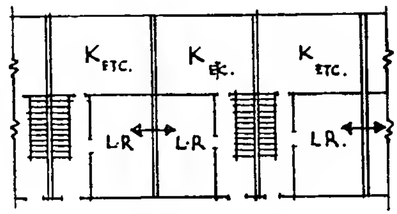




Fig. 3 Planning against noise through party walls in terrace houses

### Grouping

Houses may be built singly, in pairs, and in blocks of four to as many as ten or even more in terraces. There seems no doubt that detached houses are the most popular due to the increase in privacy provided, but the cost is greater due to increased lengths of roads, sewers and services, and to the increased amount of external wall. Detached houses have advantages to the planner, since all external walls are available for windows and access to the back door may also be on any of three walls or even on the main frontage.

It has been said that blocks should not be longer than ten houses, but it is difficult to appreciate any reasons for this statement, as lengths are more dependent on street planning and the provision of good grouping to suit individual sites. The reduction of external wall in houses built in terraces or large blocks saves in general cost and in heating.

Rural housing, where land is less costly and larger gardens are desirable and generally preferred, may be more widely spaced, and this is necessary to accommodate large outbuildings.

It is most desirable that housing estates should have houses of various sizes mixed together, not forgetting the need for houses for special occupancy, as, for example, doctors and ministers of religion; any plan should encourage the idea of community living as far as possible. Special provision should be made for old people either in the form of bungalows or in two-storey flats, with staircases leading to balcony approaches for the upper level; old people should always be housed near young relations, so that they are not cut off from easy visits; such housing should, if possible, be given sites near to means of transport and also fairly near to shops.

Flats and houses should be mixed together in all developments, as there are always those who prefer to live in a flat, even in villages or in rural areas.

Bungalows are also quite popular and, where land is cheap, as in rural areas and where larger sites are possible, this form of development should be given consideration.

### Planning Against Noise

Effective steps can now be taken with constructional developments to reduce sound penetration between semi-detached or terrace houses, and assistance may be gained by avoiding the planning of living-rooms adjoining one another. Fig. 3 illustrates in Diagram A how in terrace houses the staircase and hall may be used to act as a cut-off buffer between living-rooms, whereas in Diagram B the plan shows the main living-rooms separated only by the party wall, which, even if of special construction, will only partially control the passage of sound between two dwellings, unless costly construction is indulged in. The objection to adopting the planning shown in Diagram A is the multiplicity of chimney-stacks which may arise if every room is to have a flue suitable for solid fuel.

### Chimney Stacks

Flues may be planned either on the external or party walls, or in a central position, often on a spine wall. In the past the party wall or external position has been the most usual and is believed by many to be the most economic. However, changes in the types of appliances to be used, especially heating units incorporating combined heating for several rooms, including some trunked air-heating, may tend towards a greater use of the central position. Such positions have great bearing not only on the type of appliance but also on room planning to avoid bad placing of the heating appliance in relation to its full use by the occupants and in relation to furniture layout.

It should be borne in mind that few tenants now require solid fuel fires in upper floor rooms and prefer gas or electricity since these mean less work in cleaning and carrying fuel and quick heating is also available; while the theory that a solid fuel fire is needed in case of illness is largely exploded on health grounds so long as adequate and correctly designed ventilation is provided by means of constant flow ventilators and flues.

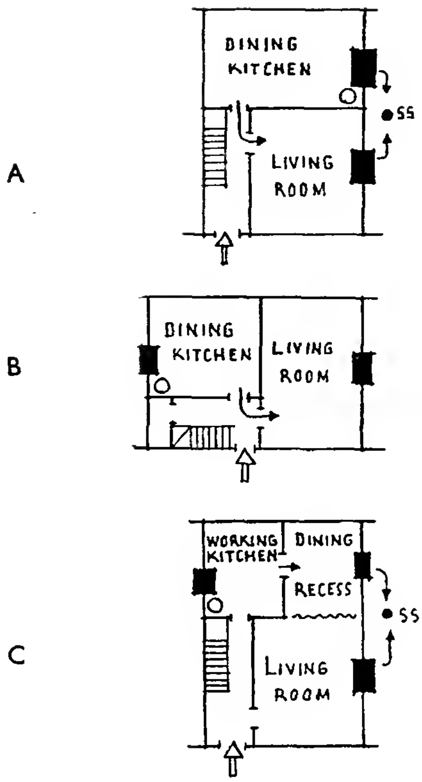



Fig. 4 Party-wall types

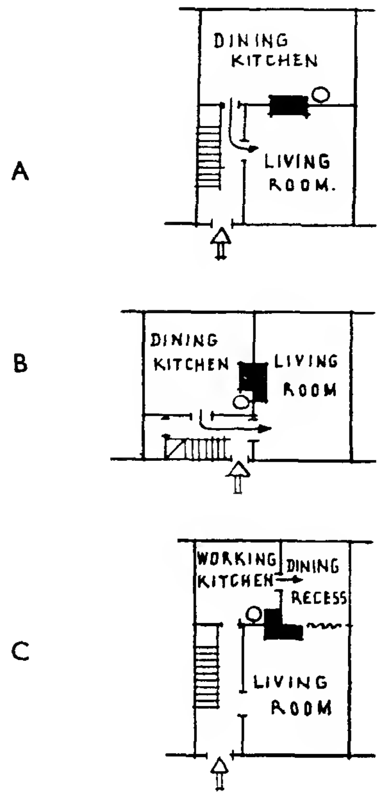



Fig. 5 Central types

In Fig. 4 A separate stacks are planned in both rooms, but may often be gathered into one stack within the roof space. In this type the fires are well placed in relation to the use of the rooms, but a long pipe run for hot water may be involved if the linen, bath and sink are at the staircase end of the plan. The possible difficulty of this type may be overcome by the adoption of the layout shown in Diagram B, the stack in the dining-kitchen being used for the purpose of hot-water heating.

If the layout shown in Diagram C is used either for this or the separate dining-room type, it is again desirable that the appliance for water heating be placed in the working-kitchen; in many plans, however, the living-room or dining-room fire heats water by means of an open fire or stove back boiler, an arrangement which frequently involves long and unsightly pipe runs and considerable heat losses. The fires in this diagram are, however, well placed in relation to the use of the rooms and allow a comfortable arrangement of furniture.

The type shown in Fig. 5 A permits of the use of a heating unit for multiple-purpose or a back-to-back grate with consequent economy, but the living-room fire is badly placed for full use, as the occupants have their backs to the light, and the space is in the darkest part of the room—a point which applies particularly to deep narrow-fronted plans.

Type 5 B is again fairly economic from the point of view of appliances and stack, but the position of the hall door makes one side of the fire-place almost unusable.

Type 5 C is likely to prove very unsatisfactory, as the stack is planned on the short wall, and any person seated on the right of the fire will be in a draught and is also in the way of access to and from the dining-recess. It has been said that with the installation of adequate background heating by means of continuous-burning heaters, the rooms will be so heated that draughts will be eliminated, and so a plan such as this is made possible for comfort; but it would seem that this is only true on the assumption that windows are airtight and never opened, also that doors are draughtproof, which is a degree of perfection not yet reached in house-building technique.

A development which, if proved to be satisfactory in operation, will have to be considered very carefully in relation to general internal planning, is the use of air ducts from the main heating appliance conveying heated air to other rooms either on the same or upper floors; such a combined appliance necessitates the use of plans of the types shown in Fig. 5 A, B and C unless very long ducts are to be used and are to be exposed on the surface of walls or of ceilings. With such appliances not only has the designer to relate the ground floor plan to the appliance, but also the room arrangement of the upper floor, which may well limit house or flat plans to very standard types.

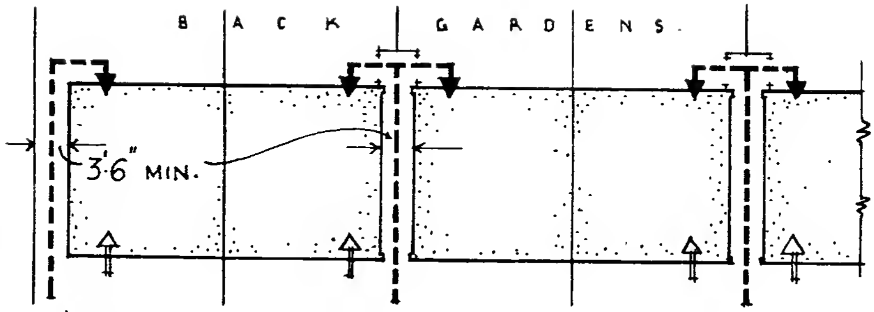
### Access

Direct front access is needed to all houses, but it is equally, if not more, important to provide proper access to back doors of all houses. Access must be such that vehicles may deliver, and refuse may be collected, with the minimum of inconvenience and loss of time. The back door is the one most used by members of the family in the lower rental types of housing. Access must be easy to the fuel store and for removal of refuse, which necessitates paths from the fronts of the houses to the rear, or alternatively back-service roadways. The former is the better solution, although in terraces or groups of houses of more units than two (semi-detached), passageways through the block must be planned for every pair of houses, to avoid passing through gardens of other houses; back-service roads or paths necessitate the carrying of all deliveries the length of the gardens and are a method more costly in road construction, as such service ways should be sufficiently strong to carry vehicles, and of widths sufficient for two vehicles to pass, or alternatively to have frequent passing bays. Passageways through blocks, however, tend to be noisy and to lack privacy. Back doors should not be placed so as to open into these passageways.

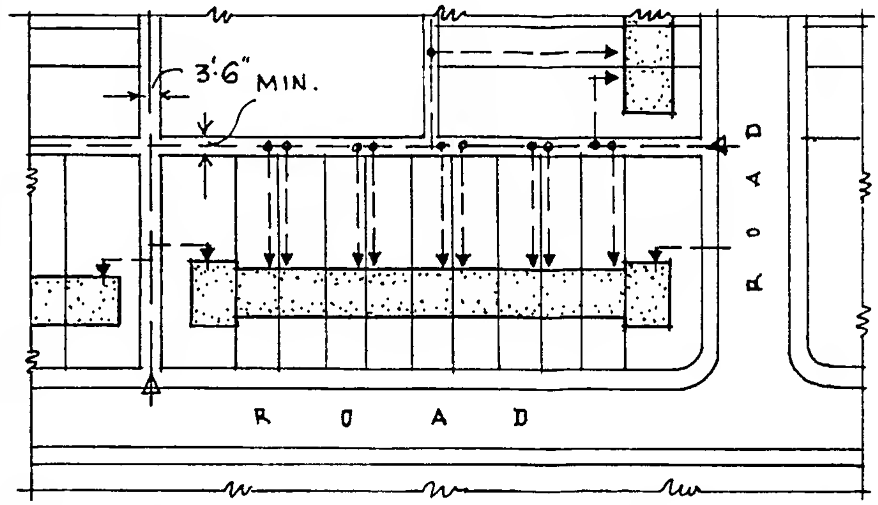
Fig. 6 diagram A illustrates normal through-passageways between pairs of houses over which the first floor is generally carried; these passageways should not be less than 3ft. 6in. wide. Gates should be provided at the entrance to each back garden.

Diagram B illustrates an alternative method of back access by means of service paths or roadways. These should be wide enough for vehicular traffic and when this is not possible, 4ft. or 5ft. should be provided for convenience of milk barrows and similar small delivery carts.

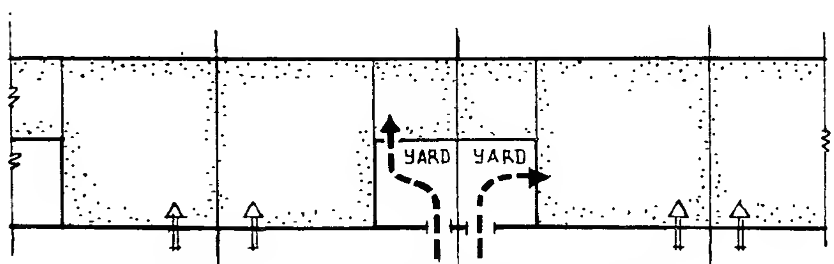
Diagram C illustrates another method of providing back access in terraces or long blocks by the formation of yards, preferably behind screen walls, which give access to kitchens, fuel stores and dustbins. Such a system can only be used where there are long frontages.




A · PASSAGES THROUGH HOUSES · TERRACES




B · PATHS AT REAR OF PLOTS.




C · SERVICE ACCESS FROM FRONT
"TERRACE" BLOCKS · WIDE FRONTAGES.

Right: Fig. 6 Three back-access methods

## Corner Plots

One of the most important and yet difficult problems to handle in the planning of housing schemes is the treatment of the junction of one street with another. Fig. 7 illustrates six typical methods of planning road corners; these are divided into two basic types, firstly, where no connecting links such as garden walls, sheds or garages are used, and secondly, where such links are introduced as a means of building up the corner. The first type will always appear disjointed, and there is always a through view which is so often far from pleasant and even very unattractive, whereas in the second type the through view may be controlled or eliminated.

Diagram A shows a treatment which provides a series of sites which are small and of irregular shapes, especially the two at the corner itself, and are difficult to handle as gardens; this type gives a full view of the back gardens.

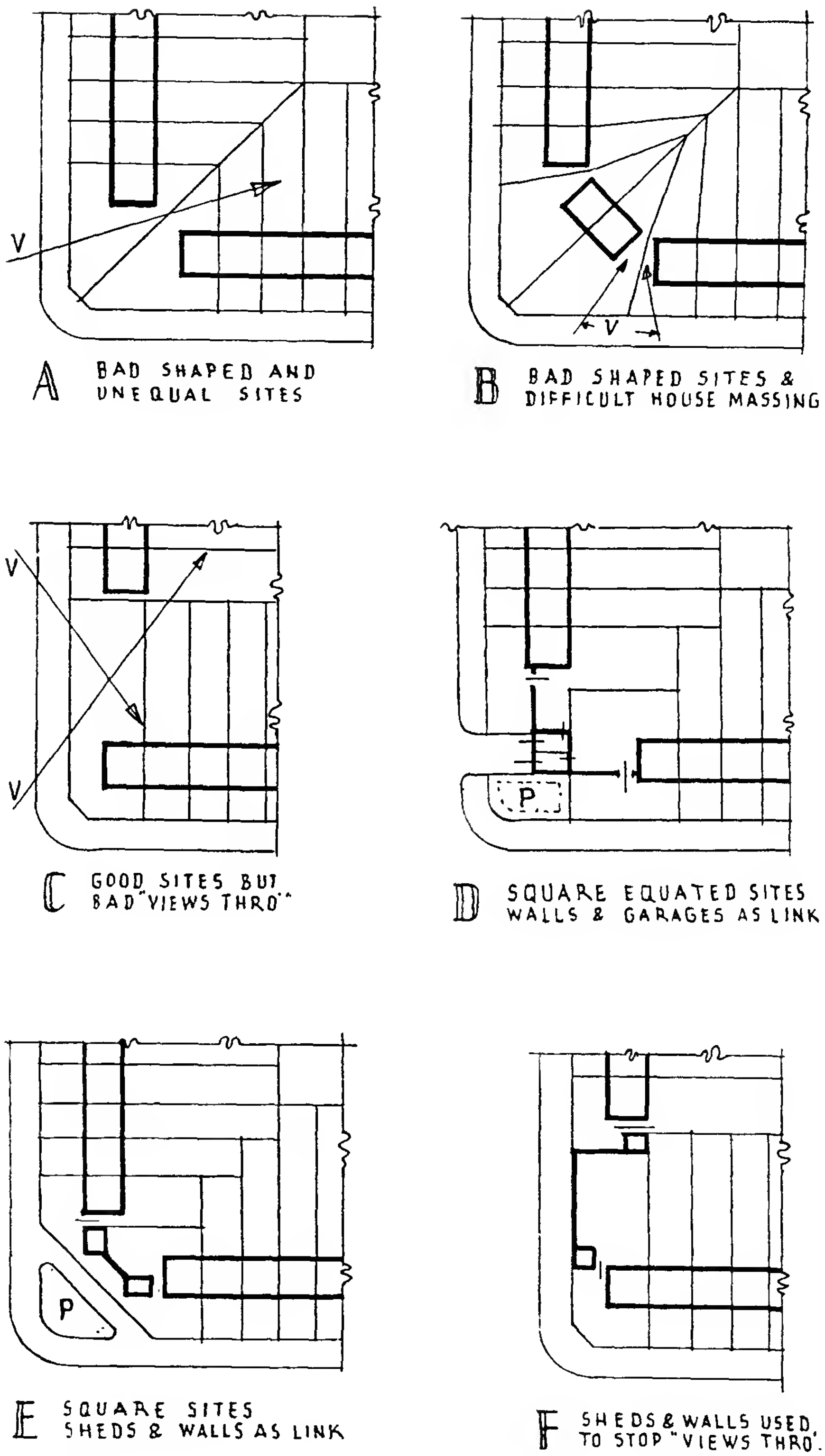
Diagram B also gives very bad site shapes and it is extremely difficult to design the massing of the blocks, whatever roof treatment is used.

Diagram C shows a type in which the through views are particularly bad, but the site shapes are better and regular.

Diagram D shows a layout in which each house site is of an adequate size and a usable shape; the connection of the houses is made by planning two garages at the corner and linking these to the houses with walls, giving a built-up corner effect.

Diagram E shows a treatment in which the corner is cut off and possibly gives a little better view to drivers of vehicles approaching the corner; in this type the corner plots are, however, a little small.

Diagram F shows a development of the treatment shown in Diagram C, in which sheds and garden walls are used as the link to prevent the through view to the backs of the houses and the gardens of the two blocks. All the diagrams show how the public footpaths may be treated, and Types D and E incorporate some planting or grassed plots which should be maintained by the local authority as part of the roadway. Sheds may be substituted for garages in Type D, and garages for sheds in Type F, but Type E does not lend itself to a satisfactory substitution of garages for sheds.




KEY
V — "views through"
P — spaces planted and maintained publicly

Fig. 7 Treatment of road corners

## SIZE OF DWELLING AND FLOOR AREAS

### General

There is a very definite need for smaller houses with only one bedroom, for old people and for a proportion of single women; there is also a need for small percentages of larger houses for families which have more than three children.

It is probable that the majority of single persons are likely to be accommodated as lodgers, although there is doubtless a demand for small flats with communal feeding arrangements and also for hostels.

Where two bedrooms only are provided it is desirable that each should be of such size that provision is made for two persons each. Where there are three bedrooms it is usual to assume that one may be for a single person only, but there has been official encouragement for the construction of three-bedroom houses comprising one double and two single bedrooms to accommodate parents and a child of each sex. If four bedrooms are provided, at least three should be double-size rooms.

Children aged less than one year are usually discounted in assessing accommodation, but there is need for a suitable space for a cot in the main bedroom.

The reasons for providing three-bedroom houses when small houses would, on family numbers alone, be apparently adequate, are:

Firstly, to meet the possibility of increases in family size. Secondly, in order to provide separate rooms for children of each sex as they grow older. The third room also provides facilities for the accommodation of an aged parent or parents who cannot afford to maintain a separate dwelling.

A further reason frequently put forward to justify the additional bedroom, is that it is for a visitor or visitors, especially members of the occupiers' family.

Still another, but much less important, use of the room is to provide a storeroom or a workshop for hobbies.

Even when two living-rooms are provided in a dwelling it is undesirable that they should be taken into account as providing sleeping accommodation.

When the number of bedrooms provided suits exactly the number of persons to be accommodated the availability of adequate storage becomes important.

### Floor Areas

"Houses, 1952" does not insist on definite total floor areas but instead sets out minimum requirements on a basis of "aggregate living-space," which is the combined area of the ground floor living-room, dining-room or dining-space and kitchen, excluding any wash-house or utility room situated in a separate out building.

This change of basis appears to have been adopted in order to encourage the reduction of all other spaces to a minimum without a lessening of the essential living-space.

It seems, however, that the minimum areas given provide total space smaller than that desirable for the comfort of the occupants.

MINIMUM PERMISSIBLE FLOOR AREAS FROM "HOUSES, 1952."

The total amounts of living-space* should not fall below the following standards:—

(1) INDIVIDUAL ROOM SIZES

*The Kitchen-Living-Room House:*

| | |
|---|---|
| Kitchen-Living-Room | 180sq. ft. |
| Sitting-Room | 110sq. ft. |
| Scullery | 50sq. ft. |

*The Working-Kitchen House:*

| | |
|---|---|
| Living-Room where there is no separate dining-space | 180sq. ft. |
| Living-Room plus dining-space | 225sq. ft. |
| Working-Kitchen | 90sq. ft. |

*The Dining-Kitchen House:*

| | |
|---|---|
| Living-Room | 160sq. ft. |
| Dining-Kitchen | 110sq. ft. |

*Bedrooms:*

| | |
|---|---|
| First Bedroom | 135sq. ft. |
| Other double Bedrooms | 110sq. ft. |
| Single Bedrooms | 70sq. ft. |

(2) AGGREGATE LIVING-SPACE

| | |
|---|---|
| 3-Bedroom house for five persons | 320sq. ft. |
| 2-Bedroom house for four persons | 280sq. ft. |

*The aggregate living-space is the combined area of the ground-floor living-room, sitting-room and kitchen and should, of course, exclude a wash-house or utility room contained in a separate outbuilding.

MINIMUM BEDROOM AREAS DERIVED FROM "HOUSES, 1952."

| No. in family | Double bedrooms | Single bedrooms | Total area of bedrooms (sq. ft.) |
|---|---|---|---|
| 3 | 1 | 1 | 205 |
| 4 | 2 | — | 245 |
| | 1 | 2 | 275 |
| 5 | 2 | 1 | 315 |
| 6 | 3 | — | 355 |
| | 2 | 2 | 385 |
| 7 | 3 | 1 | 425 |
| 8 | 4 | — | 465 |
| | 3 | 2 | 495 |

## HOUSE AREAS AND ROOM AREAS (SCOTLAND)

MAXIMUM HOUSE AREAS*

| No. of persons | No. of bedrooms | A[a] Single storey (sq. ft.) | A[a] Two storey (sq. ft.) | B[b] Two storey (sq. ft.) | C[c] Single storey (sq. ft.) | C[c] Type of bedroom |
|---|---|---|---|---|---|---|
| 1 | 1 | | | | 415 | Open |
| 1 | 1 | | | | 415 | Separate |
| 2 | 1 | | | | 485 | Open |
| 2 | 1 | | | | 515 | Separate |
| 2 | 2 | | | | 560 | Separate |
| 3 | 2 | 685 | | | | |
| 4 | 2 | 740 | 760 | 760 | | |
| 5 | 3 | 870 | 890 | 890 | | |
| 6 | 3 | 920 | 960 | 960 | | |
| 7 | 4 | 1,040 | 1,040 | 1,040 | | |

* Maximum House Areas within which it should be possible for houses to be designed from "House Design."

A[a]. Houses for young married couples and families with young children requiring individual gardens.

B[b]. Houses for families which consist of adults and several older children.

C[c]. Houses for small families, single persons, middle-aged or elderly couples.

### General

In Scotland the method of determining floor areas varies slightly from England and Wales. In addition areas are indicated for the maximum floor areas within which it should be possible for houses to be designed, if the minimum room areas are met. As with the English recommendations these areas appear to be smaller than is desirable for comfort.

### Living-space

The aggregate of living-space means the combined areas of the living-room and kitchen. The minimum amount of living-space to be provided in all types of dwellings for families of three to seven persons is as follows:—

| | Square feet |
|---|---|
| 3 person families .. | 250 |
| 4 person families .. | 265 |
| 5, 6 and 7 person families | 305 |

No standard is suggested for houses for one or two persons; but it should be possible to provide greater living-space than the minimum areas of the living-room and kitchen without exceeding the maximum area.

### Room Areas

1. Houses for one person: Square feet

| | |
|---|---|
| Living Room .. .. | 140 |
| Working-kitchen .. | 45 |
| Cupboard Kitchen .. | 30 |
| Open Bedroom .. | 60 |
| Separate Bedroom .. | 90 |
| Bathroom—(in house with open bedroom) | 40 |
| Bathroom—(in house with separate bedroom) .. .. | 36 |

2. One-bedroom houses for two persons:

| | |
|---|---|
| Living Room (in house with open Bedroom) | 150 |
| Living Room (in house with separate Bedroom) .. .. | 160 |
| Working-kitchen .. | 50 |
| Dining-kitchen .. | 75 |
| Open Bedroom .. | 100 |
| Separate Bedroom .. | 110 |
| Bathroom .. .. | 36 |

3. Two-bedroom houses for two persons:

| | Square feet |
|---|---|
| Living Room .. .. | 160 |
| Kitchen .. .. | 50 |
| Bedroom 1 .. .. | 90 |
| Bedroom 2 .. .. | 70 |
| Bathroom .. .. | 36 |

4. Houses for three persons:

| | |
|---|---|
| Living Room .. .. | 170 |
| Kitchen .. .. | 70 |
| Bedroom 1 .. .. | 110 or 120 |
| Bedroom 2 .. .. | 70 |
| Bathroom .. .. | 36 |

5. Houses of all types for 4, 5, 6 or 7 persons:

| | Working-kitchen house | Dining-kitchen house |
|---|---|---|
| Living-Room | 180 | 160 |
| Kitchen | 75 | 105 |
| | With built-in fittings | Without built-in fittings |
| First Bedroom | 110 | 120 } or { 135 |
| Other Double Bedrooms | 110 | 120 } or { 110 |
| Single Bedroom | 70 | — — |
| Bathroom | 36 | |

### Plan Types

The four basic types of plan arrangement for a given space are firstly, the working-kitchen, with separate dining- and living-rooms; secondly, the living-kitchen, with or without a scullery and with or without a second living-room; thirdly, the working-kitchen with dining-recess forming part of one large living-room; and fourthly, the dining-kitchen with a separate living-room.

Fig. 8 A is what has become known as the "universal plan" and has been widely used in private-enterprise house-building in the inter-war period. In this type the working-kitchen is separate from both the dining- and living-rooms. When this type is used on narrow frontages the kitchen tends to be cramped as it is assumed that hardly any meals are to be taken in it; all meals, therefore, have to be carried, or served through a hatch, from the kitchen to the dining-room; a method upon which opinions differ. On the one hand more work is involved, but on the other the housewife is able to eat in more pleasant surroundings away from the scene of actual cooking. This is a type essentially calling for two living-rooms, and consequently a separate form of space heating is needed in both rooms. This type also necessitates heating in some form in both kitchen and dining-room in addition to the living-room, since both rooms are used at intervals throughout the day. Back-to-back grates providing a cooker on the kitchen side and a fire on the dining-room side have been installed in this type, but such equipment places the dining-room fire very badly in relation to the use of the room. This arrangement does provide, however, a complete separation of the main rooms of the ground floor.

Diagram B may be either a two-living-room type or the whole of the living-space may be in one large living-room. The essential factor in this type is that the main cooking is carried out in the living-kitchen and therefore one fire can serve the two purposes of cooking and space-heating and often water-heating as well. The kitchen-living-room type was probably the most-used form of layout in local authority housing in the past, since it was generally thought to be the most economical in operation and therefore best suited to houses for tenants in the lower-income range, especially when solid fuel was used for heating and cooking. Without a second living-room the lack of privacy and the constant interruption of every other activity by cooking and meals are a great inconvenience. A combination grate was very often installed to try and overcome the lack of living-room atmosphere. The continuous-burning insulated cooker has been recommended for rooms of this type, but it is likely that this also will lack the features desirable in a living-room, especially if it is the only room for all family purposes. In this type the sink and laundry facilities are better if placed in a separate scullery directly approached from the kitchen-living-room, and this can provide a space in which auxiliary cooking and water-heating apparatus may be placed for summer use to avoid the sacrifice of floor space in the main room.

Diagram C illustrates a type in which all meals are prepared in the working-kitchen and mostly eaten in a dining-recess which forms part of the living-room. A variation of this type is to separate the dining-room and living-room and thus form two rooms, although direct access from the hall to the dining-room is not possible. This type is sometimes criticized on the ground that there can be only one living-room, and therefore there is no privacy or quiet. Recently a number of plans of this type have been built, but in many cases good planning of the room and its furniture in relation to its functions has been sacrificed to obtain a single heat-unit serving all heating purposes, admittedly an economy but not if made at the expense of comfort. In this type the dining-recess is usually small, with a consequent increase in the area of the working-kitchen; this permits the better spacing and arrangement of equipment and better and larger working space; the lack of which has been a defect of many houses built in the inter-war period.

Diagram D illustrates a dining-kitchen type, in which meals are taken usually at one end of the combined space, sometimes cut off by the arrangement of fixed equipment.

By this means the living-room is quite separate and consequently more suited to that part of family life not concerned with meals; it requires, however, the provision of separate space-heating for each room; this may be achieved by use of a back-to-back heater or a multi-purpose heat-unit. This type tends to make full use of the whole of the ground-floor space, the second living-room always tending to be used only for special occasions. A possible objection to the kitchen-dining-recess type is that laundry has to be done in the meal room, but this may be overcome by the provision of a utility room or wash-house; in any case, whenever space permits it is desirable that laundry should not be done in the kitchen, a condition not always possible if rents have to be kept within the limits of the lowest incomes.

Diagram E is a typical three-bedroom layout equally applicable to all types of ground-floor arrangements mentioned above. The relationship of bathroom, W.C. and linen storage will be discussed later.

All these types may be used as terraces semi-detached or detached houses, as may also the type shown in Diagram F.

Diagram F is based on the use of long frontages, and has a through living-room which meets difficulties which arise from north aspects. The longer frontage permits of the staircase being planned on the front wall with direct lighting, even when the houses are used in terraces.

By the adoption of this type of plan the living-room may have windows on to the road frontage, and the kitchen is placed at the back, the only difficulty being the planning of a larder with a suitable aspect when the houses are in terraces.

Recently official encouragement has been given to the use of what are termed "large living-room houses"; these comprise a living-dining-room out of which a working-kitchen, and the staircase, open directly. While such plans may be economic in total floor area they have grave disadvantages as they require special heating; they may, in addition be draughty, noisy and reduce privacy to a minimum.

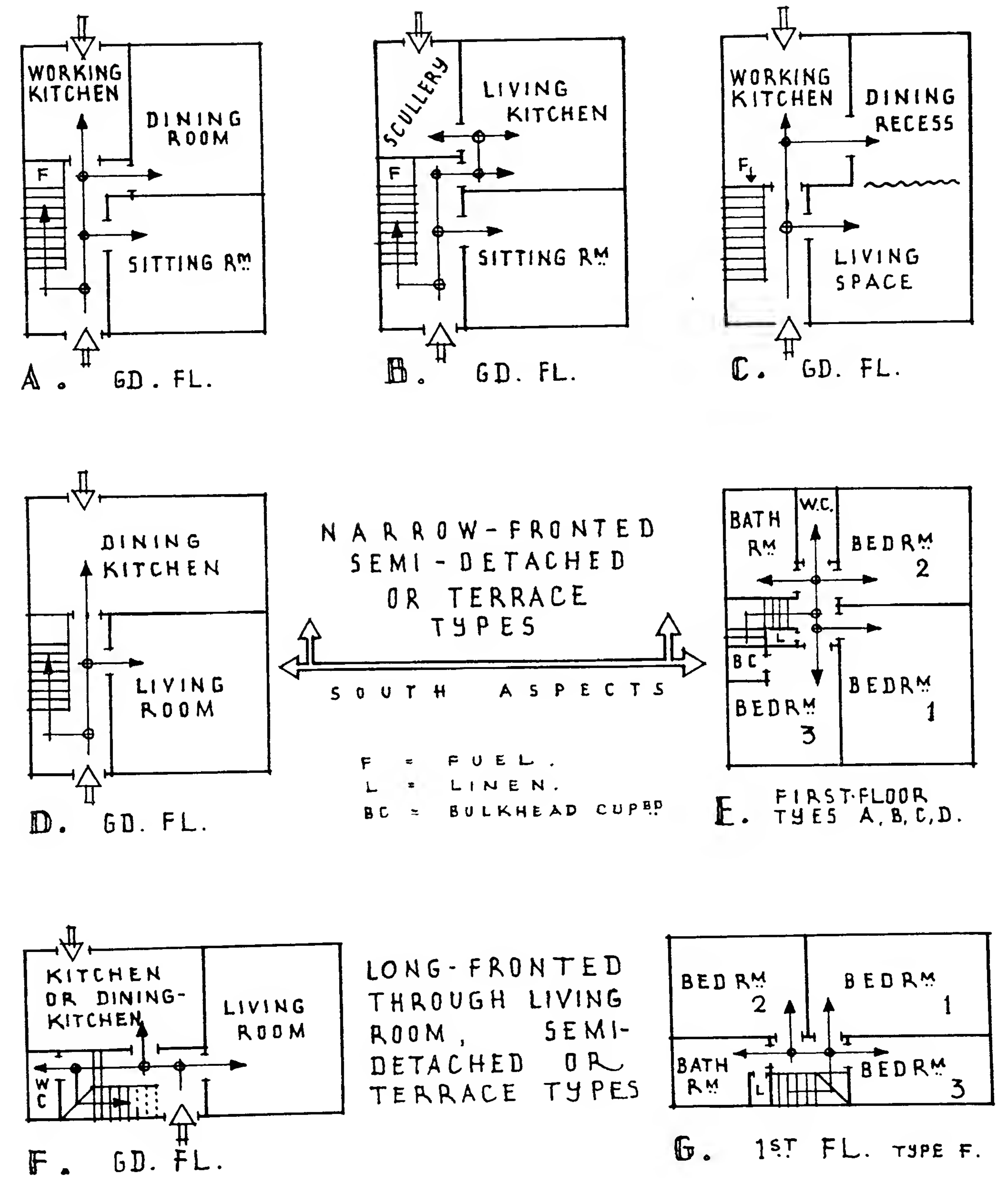



Fig. 8 Plan analysis: relation to living

# THE SECTION

### General

The type of roof influences the house section considerably, especially in regard to the span of the building. A pitched roof space provides an appreciable amount of insulation against heat and cold, assuming that a reasonably good roof construction is adopted, also a useful storage space is available for little cost. Pipes, conduits and cisterns may be installed more conveniently and remain easy of access, whereas when flat roofs are used, these service pipes often have to be embedded in the roof construction and the cisterns placed above the roof, thus presenting an increased problem of insulation against frost as well as a more difficult aesthetic problem.

Many designers place cold-water cisterns below the roof level in order to avoid difficulties of design of houses with flat roofs, but such positions tend to be unsatisfactory, if sanitary fittings or water heaters are installed on the upper floor, owing to there being an insufficient head of water.

### Model By-laws

The minimum floor heights are dictated by local by-laws and may now be only 7ft. 6in. although in some areas 8ft., or even 8ft. 6in., is still required. If rooms are placed partially in roofs the model by-laws require a vertical wall height of at least 5ft. Also a flat ceiling area at full normal ceiling height of at least half the area of each habitable room is required. The top of the opening portion of the window has to be at least 5ft. 9in. above the floor level.

### Dormer Windows

If casement dormer windows are used care must be taken to place them so as not to interfere with the continuity of the rain-water gutters when the sashes are open; if the gutter is stopped between the windows much extra cost is involved in the provision of down pipes for each section.

In detached, semi-detached or end units of blocks of houses, dormer windows may, to some extent, be avoided by the placing of windows in gable ends.

Fig. 9 illustrates alternative sections of a house by which comparisons of heights, cubic contents and amounts of usable space can be noted.

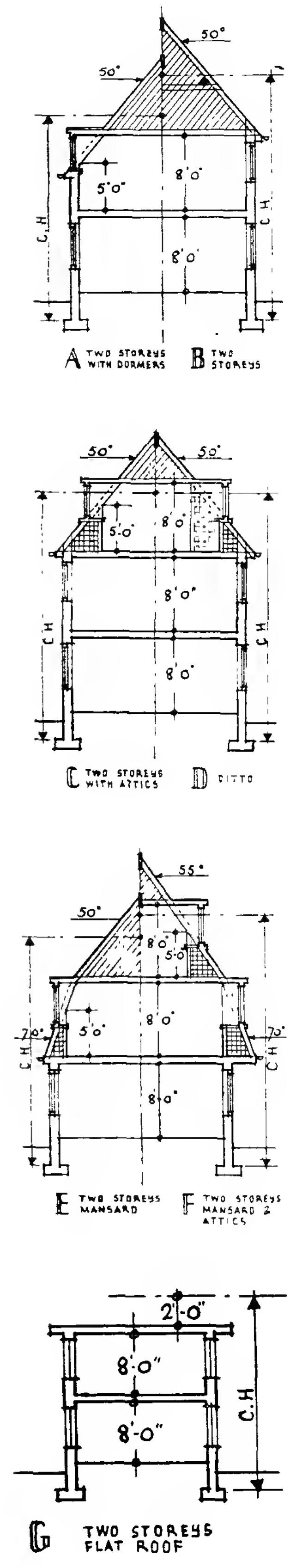
Diagram A shows a method of reducing the cubic contents to the minimum in a two-storey building; this method consists of pitching the roof 5ft. above the floor level of the upper storey, and using dormer windows. It may be found that such a design, whilst reducing the cubic content, has little effect on the total cost owing to labour and materials involved in the construction of dormer windows. The dormer windows are placed so that the ceiling level is maintained. The amount of unused space is small and only of value for tanks or storage.

The type of section in Diagram B is more straightforward from the constructional view-point and consequently tends to be more economical. Diagram B provides more space in the roof, but it is usable only as storage.

Diagrams C and D show the roof space used for rooms which, under some by-laws, may necessitate the use of thicker walls on the ground floor. In Example C more floor space is available than in Type D by the use of sloping ceilings with vertical walls placed where a height of 5ft. becomes available. If the walls are so placed as to give vertical heights equal to the full floor to ceiling heights of the rooms there is a loss of floor space amounting to about 25 per cent, although the space thus lost may be used for storage and cupboards.

Diagrams E and F show examples of the mansard type of roof. In Type E the upper floor is reduced by about one-fifth of the ground floor area. In Type F equal floor areas on the ground and first floors are obtained by projecting the floor, at first floor level, a considerable distance beyond the face of the ground floor.

Diagram G illustrates a type with a flat roof in which the cubic contents are less than Type B, but in which the cost may be the same or even greater.




Right: Fig. 9 Comparative roof sections, showing rooms in roofs, dormers, floor heights and cubes, chimney heights, etc.

# Housing

## ENTRANCES AND HALLS

### Entrances

It is desirable that steps at entrances be as few in number as possible; they are inconvenient when prams have to be taken into the house, and for old people. The paved area in front of any steps should not be less than 3ft. wide. Protection of the front door is desirable by means of either a hood or porch, especially on exposed sites; a porch is considered almost essential in rural and coastal districts. Two doors at entrances are the only effective means by which strong winds and draughts may be excluded from the house. Main entrance doors should not be less than 2ft. 9in. wide to permit satisfactory handling of furniture or prams. A letter plate should be provided at all main entrances. Entrance doors should never open directly into living-rooms.

Doors should be provided either with a slightly-raised sill or with a mat sinking: alternatively the external step should be raised about one inch above the internal floor level.

### Halls

The hall provides access space for all ground-floor main rooms and for the staircase. It is essential that it should have direct and adequate daylight.

Artificial lighting of halls and corridors should be planned carefully to light the whole floor area, the stairs, visitors at the front door, and to give light into shallow cupboards.

### Prams

Accommodation should be provided for storing a pram, as the latter and its bedding must be kept dry and this is seldom possible in unheated outbuildings; not only should there be pram-storage space, but also space in which to move the pram into the storage space. *See* diagrams in Fig. 10 and Part 1: Transport.

### Hats and Coats

Accommodation should be provided in halls for the storage of hats and outdoor clothing either in movable or fixed furniture; the normal provision of a few hat-and-coat pegs is undesirable; they provide bad storage, are unsightly and tend to be in the way. It is preferable that such accommodation be planned in a recess, so that circulation spaces are not obstructed.

Recesses if used should be either 2ft. wide and at least 9in. deep, or 2ft. deep and 12in. wide; the former provides for the use of hangers parallel with the back wall and the latter allows for hanging at right angles, which is more satisfactory. If exposed coat-and-hat pegs are used the recess need not be deeper than 6in. and hooks should be about 9in. apart. If closed cupboards are used they should be based on a minimum depth of 1ft. 3in. for hangers parallel to the door, with a minimum width of 2ft. in the clear; it is better to use hangers at right-angles to the door and the dimensions should then be reversed; if possible, the width of such a cupboard should be increased to 2ft. 6in.; such a space will hold ten coats.

The cupboards should have the hanging rod at least 5ft. above the floor level and 6ft. if shoes are to be kept on the cupboard floor. A high-level shelf for hats is required and should allow a usable height of 8in.

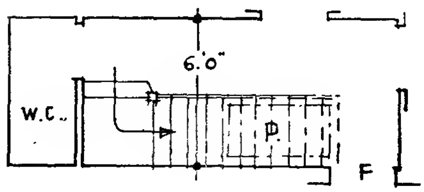
### Staircases

*See* general information in Part 1: Circulation.

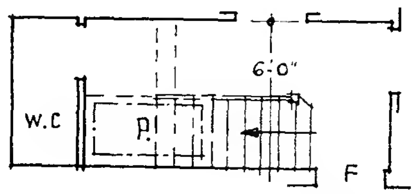
### Meters

Space must be provided for gas and electricity meters, the latter with its distribution board. The whole is now usually provided in the form of a consumer's control unit (see B.S. 1454).

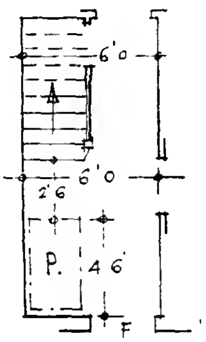
Fig. 11 illustrates the amount of space which should be provided to accommodate electric-meter boards on which all the necessary distribution apparatus can be fixed, and for gas meters, together with the space required for piping and control valves. These may be enclosed in cupboards, either singly or together; in the past they have often been too cramped, due to very small total floor area allowances, but with the general increases now advocated the reason for such cramping is eliminated; on the other hand, hall and corridor space is not effective living space and should not be wasteful.

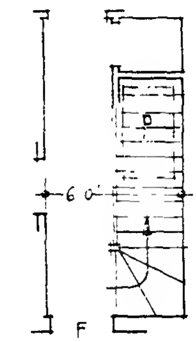



A Wide frontage—good




B Wide frontage—bad



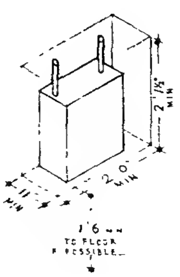




C Narrow frontage —good

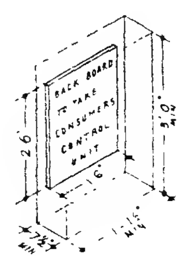
D Narrow frontage —bad

KEY
P—perambulator
F—front door
All arrows on stairs indicate "up" direction
Mat-wells should be provided on ground-floor level, arranged to be 1in. below external step level

Fig. 10 Entrance halls




A · GAS SUPPLY




B · ELECTRIC LIGHT

Fig. 11 Meters

### Floor Areas

The floor areas so far given for living- and sitting-rooms are those needed for three-bedroom houses in which a maximum of five persons may be assumed.

Where the family is to be larger it is desirable that the areas should be increased by 10sq. ft. to 20sq. ft. per person, the number for whom the bedroom accommodation is planned over the first five persons. Where houses are designed for fewer people the living-room may well be reduced to 150sq. ft. to 160sq. ft. for two-bedroom houses and to 140sq. ft. for a one-bedroom house. In dwellings for old people the living-room should have an area of at least 140sq. ft. to which should be added space needed for bed recesses, or for any built-in furniture. Some built-in furniture may be required, but should be confined to cupboards and bookcases, and generally this is not large in quantity, as occupiers usually prefer their own furniture.

### General

There are certain factors common to several or all types of living-room, such as the essential furniture, placing of fires, windows and doors and these should be considered in conjunction with aspect, prospect, and day and artificial lighting. It is necessary first to consider various basic types of living-rooms, as varying uses have influences on the plans to be adopted. It is impossible to say that any one type is better than others, and estates should provide for different types of living-room if tenants are to be given a reasonable choice of houses to best suit their own way of life. The important factor is to try and so plan the house that full use is made of the whole of the available space, but it is likely that good distribution of heating facilities may contribute as much to this end as actual planning.

### Types of Living-Room

1—The combined kitchen-living-room in which the family has to cook, eat and carry on all the activities of family life.

This type usually has a scullery attached to the living-room, which is approached directly without passing through the hall.

2—The dining-living-room, in which those meals not taken in the kitchen are eaten and in which general family life is carried on: but no cooking takes place in it.

3—The living-room used only for general family life, cooking being in a kitchen and meals taken either in the kitchen, dining-kitchen, or in a separate dining-room.

4—The living-room with dining-recess, but without facilities for cooking as in Type 1.

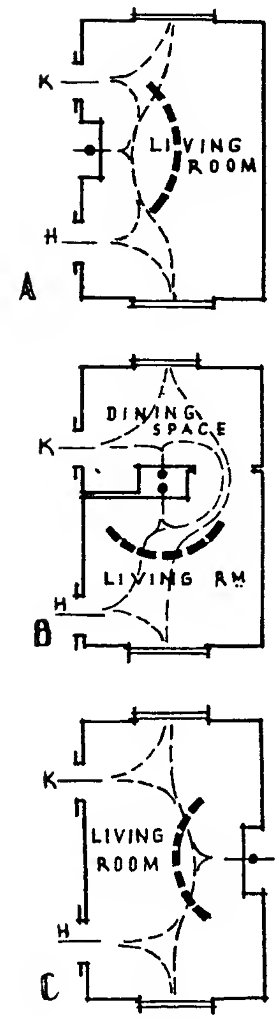
In all types there may be a second living-room, referred to in this section as the sitting-room. Formerly this room has usually been called the parlour. This room is generally similar to No. 3 above, excepting that the area is usually somewhat smaller.

### The Fireplace Area

The use of the living-room tends to centre round the fireplace, which must be so planned that a group of chairs may be arranged round it without interruption by circulations, nor must any part of such a group be untenable due to draughts between doors, windows and the fire. Even if the open fire becomes less used and is replaced by openable stoves by which means greater value may be obtained from the fuel consumed, the same planning conditions must be met and even if central heating should become general some local heating such as electric or gas fires will be needed and will thus necessitate somewhat similar planning. Fireplaces are best if planned centrally on a wall not less than 11ft. long, with side light from the window. Corner fireplaces should always be avoided. The type of fire depends on the precise use of the room.

### Layout

Fig. 12 illustrates various typical layouts of living-rooms and the relationship of windows, doors and fireplaces to one another and their effect on draughts and circulations in the rooms. The "through" types of living-rooms, as shown in Fig. 12 A, B and C, are the most difficult to plan if draughts are to be avoided between doors, windows and fireplaces. From the point of




"Through" living-room types

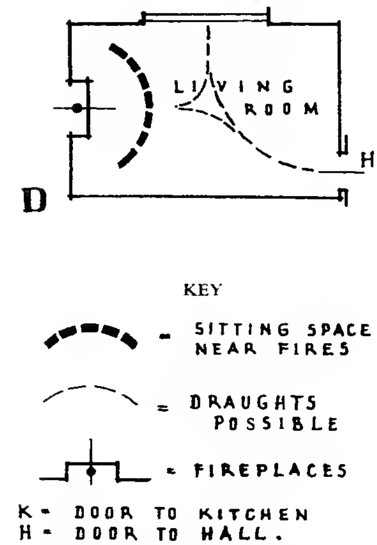



Fig. 12 Living-room layouts, showing draughts, etc.

view of draught, Type A is possibly better than Types B and C, as the air from the doors draws more directly into the fire and the occupants can, to some extent, sit beyond or outside the main draught lines, but from the point of view of sitting comfortably round the fire the doors are too close to the fire and circulation interrupts the "family circle." Type C may be slightly more draughty, but the circulations between the room doors will not disturb the sitting-space. Type B is likely to be unsatisfactory from the aspect both of draughts and interruption of the sitting-space by circulation; the dining-space is also likely to be draughty; for these reasons the omission of the connecting doorway or opening between this space and the living-room may make both rooms much more pleasant, even at the cost of a little more walking for access between parts of the house.

Type D illustrates the best arrangement of a "non-through" living-room for avoiding draughts.

Rooms are generally more satisfactory if rectangular rather than square, but irregular shapes should always be avoided, and also rooms which are very long and narrow. The minimum dimension in either direction should not be less than 11ft. Daylight should preferably be from one of the longer walls, unless it can be from the two ends, although rooms with light from both ends make it impossible to sit at either side of the fireplace without facing the source of light from a window. Rooms of greater depth than 12ft. from a window wall are undesirable, but are sometimes unavoidable with narrow frontages in terrace houses.

All living-rooms should be planned to accommodate a normal amount of furniture, depending on what other rooms are provided in the house. Windows and doors should be so planned as to leave good wall spaces against which furniture may be placed. Some built-in furniture may be required, which should be confined to cupboards and bookcases, and generally this is not large in quantity, as occupiers prefer their own furniture in these rooms.

### Sitting-Room

Very varied opinions have been expressed as to the desirability of providing a sitting-room in addition to the living-room, or whether it is better to throw the whole available floor space into one large room. The second room provides an opportunity for quiet and privacy which are almost impossible in one living-room in a family house; it is also a room which is generally more tidy and thus available for visitors without clearing up the general living-room. It might with advantage serve as a quiet room for homework for the older children.

Sitting-rooms should have a floor area of at least 110sq. ft., but areas up to 160sq. ft. are very desirable. It is not so important to increase the floor area of sitting-rooms in houses for families greater than five persons. As in living-rooms, family life tends to centre round the fire, which is best placed with side light from the window. As the room is used intermittently, gas or electric fires are often preferred to solid fuel owing to the possibility of obtaining a rapid heating-up of the room; it seems, however, that it is desirable to provide a flue suitable for burning solid fuel for those who prefer this form of heating.

### Furniture

The dimensions of living-room furniture are given in Part 1.

### Doors and Windows

Doors in living-rooms should be as few as possible and not less than 2ft. 6in. wide and preferably 2ft. 9in. for easy movement of furniture. Windows should be equivalent in area to at least one-tenth of the floor area; one-half of the total window area should open, unless daylight obstruction is exceptional. Tall windows, with heads as near the ceiling as lintels will permit, give better lighting than long horizontal windows of equal area, and leave more wall space. The glass line of windows should not be much less than 2ft. 2in. above the floor level, which provides a good outlook from a seated position and avoids cold air near the floor. Unnecessarily large windows should be avoided, as the heat-loss through windows is very considerable unless double glass or double windows are used; the expense of such provisions may be great. A combination of windows and doors is frequently used, especially to give access to the garden, but great care in planning and in constructional detailing is needed to avoid undue draughts, especially at floor level.

### Ceiling Heights

Heights of rooms must conform to the statutory requirements of 7ft. 6in. or 8ft. (or 8ft. 6in. in a very few districts), but heights greater than this essential requirement are seldom necessary as the floor areas are so small, also, any increase in height above the minimum involves both increased capital and maintenance costs without return.

### Artificial Lighting

Artificial lighting should provide for lighting over the dining-table if the room is used for meals. General lighting from ceiling fittings is usual, together with at least one or more socket outlets for standard or table lamps: the illumination should be equal to 6 f.c. over half the area of the room, increased by the local lighting to about 15 f.c. for reading and rather more for sewing. Socket outlets are not only used for local lighting but also for radio, sewing machines and similar domestic appliances.

## DINING-ROOM, DINING-LIVING-ROOM, LIVING-ROOM WITH DINING-RECESS

### General

This paragraph refers to dining-rooms which are separate from other living-rooms, although it is probable that such rooms will be used for other purposes than meals only, as, for example, for children's homework, for which a table is essential, and it is probable that the kitchen will be the only other room having a table adequate for this purpose, especially if there is more than one child working simultaneously. Separate dining-rooms would appear to be necessary only in larger houses than those of minimum area for the three-bedroom type.

### Floor Area

The floor area of a dining-room should not be less than 140sq. ft. The room should be either square or rectangular, the latter being preferable, as the most general shape of tables is also rectangular, especially when fully extended. The dining-room should not be less than 10ft. 6in. wide.

### Windows

Windows should be placed on a long wall whenever possible, and it is advantageous to place the sill level above the table level of 2ft. 6in., which permits the table to be placed close to the window if desired.

### Furniture

The dimensions of dining-room furniture and of the space required around the furniture are given in Part 1.

### Dining-Recess

Dining-recesses when part of the living-room have been discussed above, but when planned as an adjunct to or part of the kitchen they will be discussed in detail under " Kitchens."

### Heating

If the room is to be used for meals only, with occasional other intermittent use, such as for homework, solid fuel fires may not be required, and preference should be given to gas or electricity, possibly supplementing hot air heating or hot-water radiators from the living-room fire; if, however, the room is likely to be in general use as a sitting-room, more continuous types of heating may be required.

### Doors

Doors should be as few as possible in dining-rooms; direct access to and from the kitchen may be considered desirable in small houses, but it is often convenient to use a service hatch in preference to a door, since by its incorporation in a cupboard fitting much space may be gained. Doors should not be less than 2ft. 6in. wide.

### Lighting

Artificial lighting is essential over the table with an intensity of 6 to 10 f.c. at table level and at least one socket outlet should be provided for small appliances in addition to any outlet provided for a fire.

### Service Hatch

Service hatches when provided should not be less than 15in. high in the clear and 2ft. wide when the doors are open; they should be so arranged that there is a shelf for table space on both sides.

Fig. 13 illustrates two types of service hatch, each based on the essential dimensions of B.S. 1195, Kitchen Storage Fitments. Type A is formed as part of a dresser fitting installed between two tall cupboards, and Type B is formed by using a low cupboard either 1ft. 9in. or 3ft. 6in. long adjoining a dresser fitting, thus providing a considerable length of table space adjoining the hatch opening. A development of a fitting shown in Type A is to use it to form the partition between the rooms, in which position the drawer or drawers below the table top may open into both rooms and the cupboards may be similarly designed, if required.

### Dining-Living-Rooms

Generally these rooms should be similar to kitchen-living-rooms except that the area might be reduced a little, although only a small amount of floor space can be saved by the removal of the cooking appliance and certain equipment, such as the dresser, into the kitchen. An open fire or closeable stove takes the place of the cooker, but this may still have to be provided with a back-boiler for water-heating, unless a separate boiler or a back-boiler to the cooker is installed in the kitchen. The storage fittings are transferred to the kitchen so that these fittings may be in correct relation to the preparation of food and washing-up. It is desirable that a hatch be planned between the kitchen and the living-room unless a door is planned in its place; the hatch may involve more walking from room to room, but it tends to make the living-room more pleasant and reduces draughts between it and the kitchen. The room should be so planned that the table does not spoil the sitting space round the fire and is placed where there is good daylight.

This type of living-room does not seem likely to be used very widely, although it tends to assist in making a very full use of the whole of the floor space provided and all cooking is confined to the kitchen; nevertheless, the formation of a dining-recess as outlined below seems preferable. This type of room is likely to be in the form of a " through " room in order to provide adequate light for both parts, unless used on a narrow frontage site.

### Living-Room without Dining or Cooking Facilities

This type of living-room may be reduced in area to 160sq. ft. to 180sq. ft., due to the elimination of the large table necessary for meals. Direct access between the room and the kitchen or dining-kitchen may be desired, but it should be borne in mind that any additional door to that between the room and the hall uses valuable wall space, tends to create draughts, and is apt to cause inconvenient circulations which restrict furnishing and the full use of the room.

### Living-Rooms with Dining-Recess

The floor area of rooms of this type should be larger than kitchen-living-rooms or dining-living-rooms without

a recess; the recess is used mainly for meals, although the table is likely to be used for some other purposes such as homework. It is suggested, therefore, that the area be at least 210sq. ft., and, better, from 225sq. ft. to 245sq. ft. The room should be planned to give a defined space to the dining-recess, which should not be less than 8ft. wide; space should be allocated for a sideboard and for a food trolley, the latter near the door to the kitchen. Direct access from the dining-recess to the kitchen is desirable, but a hatch may be substituted.

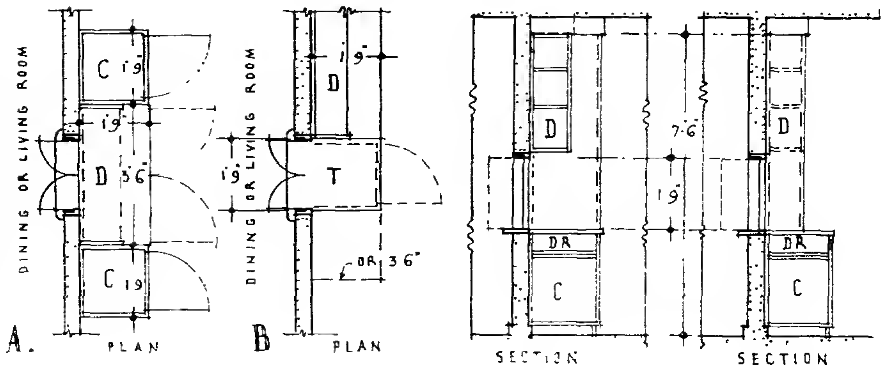



Fig. 13 Service hatch

### Heating

It is desirable that there be some means of heating this recess in cold weather, as the main fire may not do so satisfactorily; this secondary heating may well be a radiator from the room fire, or a small gas or electric unit.

### Sill Height

Sill level should be kept above the table level of 2ft. 6in., and therefore about 2ft. 9in. above the floor level.

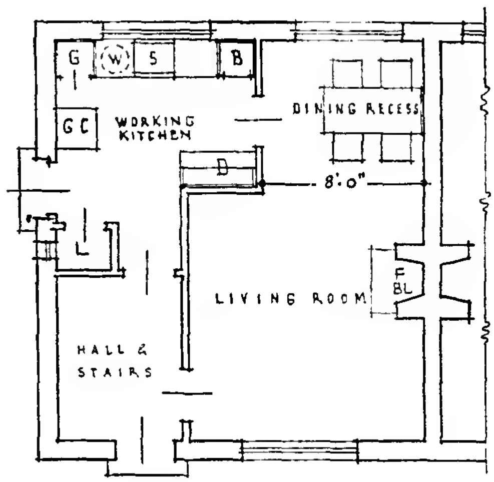



Fig. 14 Living-room with dining-recess and working-kitchen

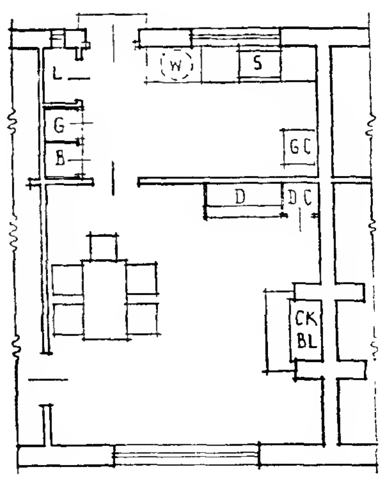
### Circulation

Circulation round the table may best be achieved by placing the table as indicated in Fig. 14, which illustrates a typical layout of this type of living-room, with its relationship to the kitchen and the hall. The storage fittings in the kitchen are all planned to be in good relation for the preparation and service of food.

Fig. 15 illustrates a typical kitchen-living-room, with scullery attached. It should be noted that the doors in both rooms are planned on one side to avoid draughts in the main working- and sitting-spaces. The dresser is placed so as to be convenient to both the cooker and the table; it is probable that the dry-goods store may be preferred adjoining the dresser instead of the larder. The drying-cupboard is planned near the fire to reduce the length of circulation pipes to the cylinder, but if this is to be used for drying laundry, a position on an outside wall is desirable in order to provide sufficient ventilation; also the cylinder must be placed elsewhere.

KEY

L—larder
*G — dry-goods cupboard
*B—broom cupboard
*D—dresser
DC—drying cupboard
T—table
W—wash boiler under
*S—sink drainer
GC—gas cooker
F & BL—open fire with back boiler
*—standard fitments



Right: Fig. 15 Working-kitchen and living-space

### Kitchen-Living-Room

It is recommended that the floor area should be 180sq. ft. to 200sq. ft., except when a sitting-room is provided in addition, when the area may be reduced to 170sq. ft. to 180sq. ft. The room should have an appliance which will combine cooking, room heating and heating water; it therefore seems that solid fuel is likely to be used in almost all cases: many occupiers prefer to use types of cooking appliances with an open fire, which is more pleasant, as the room is essentially also a living-room as well as a kitchen. More recently developed types of these appliances have fires based on the "openable-closed" stove principle, which should be more efficient for both water-heating and cooking, without any loss of the general comfort provided by an open fire. The room must be planned to provide sitting-space round the fire, table-space for meals, and space for the essential storage fittings. A scullery should adjoin this type of living-room and have direct access from it; the scullery should accommodate the sink, the wash-boiler (if not in a wash-house) and facilities for summer water-heating and cooking by electricity or gas, if available.

This type of living-room, although so widely used in the past, is the least satisfactory in many ways, especially as family life is disturbed by cooking and meal service, but on the other hand it is probably the most economical form of living. If, however, total floor areas for dwellings are to be increased from the pre-war areas to 850sq. ft. or more for a three-bedroom house, it seems possible that the combined kitchen-living-room will be less widely adopted, except perhaps in rural areas.

The essential storage fitments should include a broom cupboard, a dry-goods store and the "dresser," or better its equivalent in the form of cupboards in which china, glass, cutlery, etc., may be kept. It is better if the broom cupboard is placed in the scullery, but in this type of room the dry-goods store, and the dresser are more valuable in the living-room near the table where food is prepared and the cooker.

### Kitchens

The combined kitchen-living-room having already been discussed under "living-rooms", it is now possible to pass to the working-kitchen and to the kitchen-dining-room.

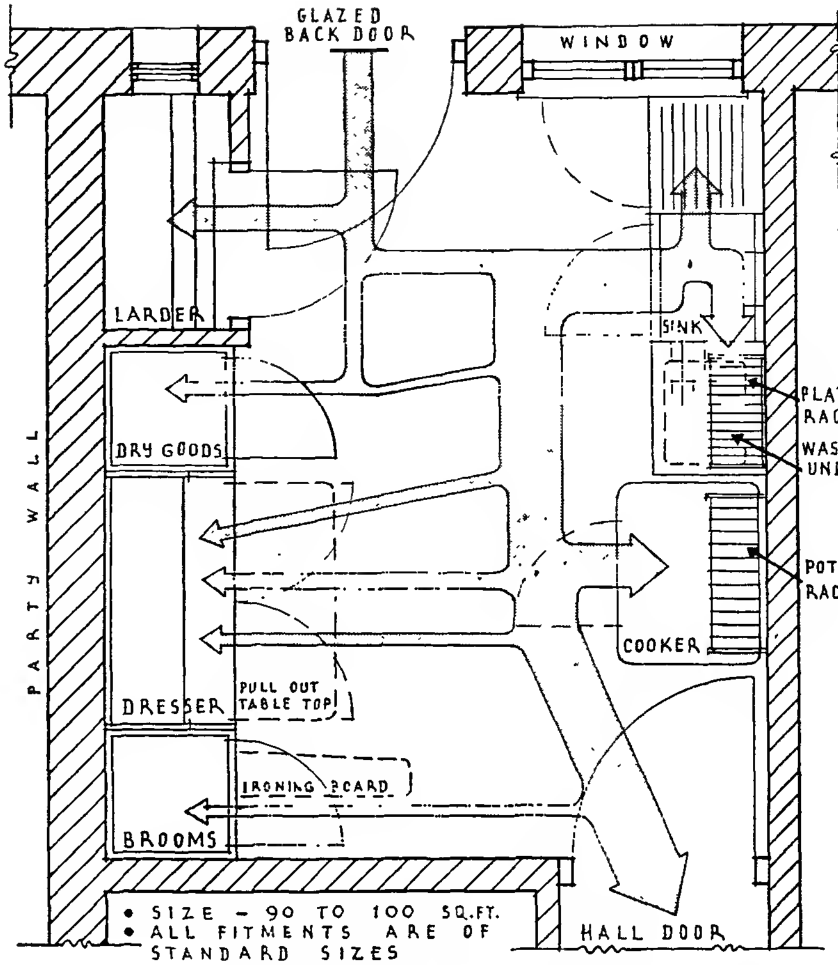



Fig. 16 Working-kitchen with its more important circulations

The kitchen plan is a complex problem; it is the workshop in which the housewife performs many operations of widely differing natures. Good and lavish equipment by no means provides a solution; for, unless such equipment is properly arranged and the space is planned as a whole, labour and effort is not reduced; it is the relationship of equipment to use and the sequence of operations that are the important factors. There are three main groups of work to be planned for in the kitchen: food preparation, washing-up and laundry work; it is, of course, better if the last is relegated to a wash-house or utility room whenever possible and if space can be provided. Certain units of equipment such as the sink, are used for more than one of these groups of work but broadly, each group has special units associated with it. It is therefore of the utmost importance to consider carefully the sequence of work and the fittings involved in order to plan the whole correctly. It must also be borne in mind that a housewife is seldom able or in fact needs to spend much time over any one operation; she is constantly changing from one type of work to another, and that implies compromises which are always necessary in the types, position and working heights of fitments; if the same working operations are to be performed for many hours continuously, such compromises or "averages" do not so often arise.

The sequence of operations in connection with meals is:

1—Delivery or collection of goods together with storage.
2—Preparation of food.
3—Cooking.
4—Preparation of the dining-table.
5—Distribution of food to the table.

6—Return of food and crockery from the table.
7—Washing-up.
8—Putting away of washed-up crockery, glass and cutlery.

Item 1 involves the larder, store cupboards and, if provided, the refrigerator. Item 2 needs the use of work-top and table-top surfaces, together with the sink, and these must be closely related to each other and to the larder and cooker, the last being the major feature of item 3. Item 4 requires linen, china, glass and cutlery to be taken from storage to the table, partly by way of the work-top, or in the case of hot plates and dishes, by way of the cooker, and cannot be completely separated from item 5, which involves the conveyance of food from cooker and work-top, together with some food directly from storage to the dining table. Item 6 reverses the processes of items 4 and 5, so that surplus food is returned to storage, dirty china and cutlery to the sink, clean china and cutlery, together with linen, to storage. Item 7 is a considerable process, requiring in itself several distributive movements, while item 8 is somewhat similar to part of item 6.

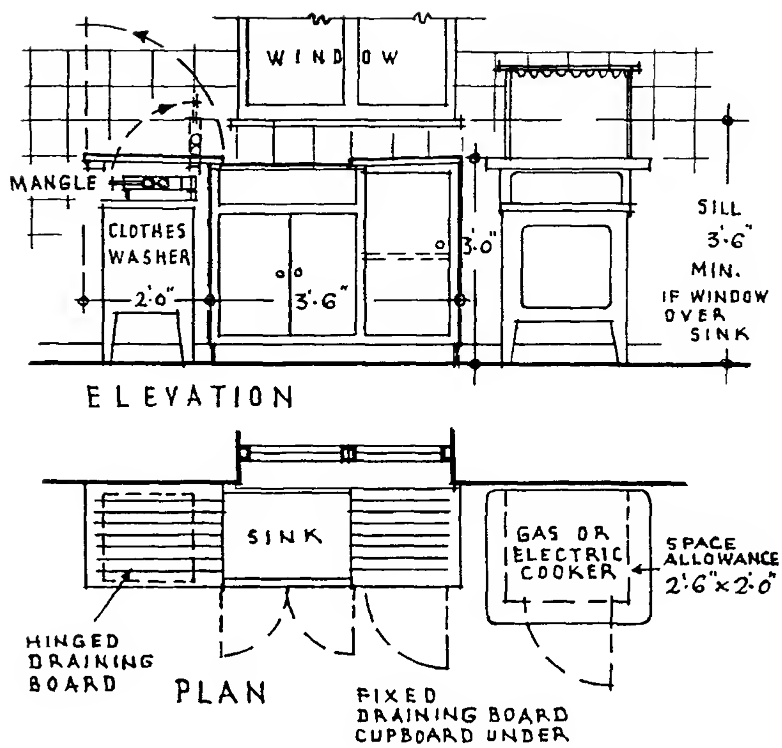



Fig. 17 Typical small sink unit for a working-kitchen

Fig. 16 illustrates how the equipment for kitchen operations may be arranged to meet the sequence of operations with a minimum of expenditure of time and effort; the shaded arrows are an attempt to indicate the approximate amount of traffic between the various pieces of equipment; from this figure it will be obvious which equipment should be placed together and which should be nearest to the dining-room. The ideal layout for a kitchen can seldom be achieved owing to the complex nature of the various factors. A number of figures used to illustrate other parts of this book also shows outline layouts of kitchens and should therefore be referred to.

The other main work apart from food preparation and service in which the kitchen is involved is that of laundry; this may be divided into three sub-groups, washing, drying and ironing, of which the first is in itself a series of separate operations. It is undoubtedly better if laundry work can be kept apart from that of cooking by the provision of a wash-house, owing to heat, steam and smell involved, apart altogether from any consideration of the dislocation of the normal use of the kitchen; this last point may not be thought so serious since the same person, the housewife, usually has to do both laundry and cooking and even at the same time look after her children at play.

### Floor Area

Floor areas for working kitchens, in which it is assumed that only minor meals are served, should be 90sq. ft. to 100sq. ft., but for dining-kitchens the area should be increased to 110sq. ft. to 125sq. ft. Kitchens with definitely separated dining-space, as, for example, a dining-recess, require larger areas for reasonable comfort.

### Dining-Recess

The information already given for dining recesses forming part of living-rooms is equally applicable to dining-recesses attached to kitchens. The dining-recess should be cut off from the rest of the kitchen as much as possible.

### Sequence of Operations

In order to plan kitchens with correct sequences of operation it is probably best to commence by fixing the position of the sink and the cooker. Sinks should preferably have the window directly in front of them, but near side light may be satisfactory and the wall-space behind the sink is very valuable for such items of equipment as plate-racks and utensil-racks. The cooker should have good light on the hot-plate and into the oven, but at the same time it must be planned to be away from draughts between doors and windows; side light to cookers is usually the best. If a cooker is placed in front of a window the interior of the oven is badly lighted and if opposite the window the user casts a shadow over the working surfaces.

### Lighting

It is essential to have good lighting in kitchens both by day and night. Windows should be planned to give even and adequate lighting for all working areas, and particularly for the sink, cooker, and the food preparation surfaces. Windows should reach as near the ceiling level as possible for reasons of ventilation as well as for lighting. It is better if windows are rather larger than the statutory minimum. Artificial light can seldom be provided adequately from one source; two points, at least, should be provided, if possible: the light value should be at least 5 f.c. and, better, 6 f.c. to 10 f.c. on working surfaces.

### Sinks

If sinks are placed under windows, the sill level should be at least 3ft. 3in. above the floor and even then a type of sink with a back shelf through which the tap unions rise should be used. If supply pipes and taps are fixed to the wall over the sink, the window sill should be 3ft. 9in. above the floor. Sinks should be not less than 1ft. 3in. by 1ft. 9in. water area and if to be used for laundry should be capable of containing 7 gallons to 8 gallons of water, and this is about the size of the normal 24in. by 18in. by 10in. fireclay sink.

Sinks of lesser depth may be satisfactory for washing up only, but deep sinks have advantages when one is washing pots and preparing vegetables. At least one and, whenever possible, two draining-boards should be provided, each not less than 21in. long and preferably much longer.

Sinks should be at least 2ft. 10in. high above the floor to the rim, and if to be used in conjunction with other fittings, a height of 3ft is now usual and will be found to be quite satisfactory, especially if the sink is to be used for laundry work. (*See* Part 1 and British Standards 1195, 1206, 1244 and 1255, which give information on kitchen equipment.)

If the sink is to be used for laundry, and unless a mechanically operated washing machine is to be installed, it is usual to hinge one draining-board and plan beneath it a wash-boiler, heated by gas or electricity, and to provide for fixing a wringer between the wash-boiler and the sink, either on the boiler itself or on the rim of the sink. (*See* Fig. 17 on p. 85.) When a tub-and-sink combination is installed provision is generally made for the wringer between the two parts. Such an ideal layout cannot always be achieved when a solid fuel wash-boiler is installed, due to difficulties of planning the necessary flue. The tub-and-sink combination is an appliance usual in Scotland, and though little used elsewhere, has many merits; not only is the deep tub, at least 13in. inside, ideal for laundry work, but also for washing large utensils and vegetables. There is also the advantage that the sink used for food preparation does not need to be used for laundry. Tub-and-sink combinations require more space than a sink; they are 4ft. long by 2ft. wide, but if a loose draining-board is fitted over the tub the effective length of the sink and draining-boards remains about the same.

### Work-Tops and Shelves

It is now general to make the work-tops of the normal range of fittings at one level, namely, 3ft. above the floor, this height being dictated by the inside surface of the bottom of the sink, which should be about 2ft. 3in. above the floor to avoid excessive stooping. The 3ft. level is very satisfactory for many purposes, although it may be a little high for some operations; it is, therefore, desirable to plan for the installation of one part of the working surface at a height of 2ft. 9in. or 2ft. 10in. or to provide floor space for a free-standing table of this height; this may be done by the use of a flap-table or by a pull-out work-top on the dresser fitment.

It is also desirable to provide space for a small table of normal height at which work may be performed when the housewife is seated on a normal chair.

It is considered by many authorities to be better, although it is less attractive in appearance, not to enclose spaces under sinks and draining-boards, but to install grids on which utensils may be stored. It is particularly difficult to keep cupboards under sinks or draining-boards clean and dry when wooden or other applied draining-boards are installed, as it is impossible to make the junction between the draining-board and the sink rim watertight; also, water and condensation may run down the back wall, finding their way into cupboards by way of the joint between the draining-board and the wall. The minimum length of 8ft. of shelf-space for utensil storage should be provided at a normal arm's-length height, though it is obviously advantageous that handles of utensils placed on shelves should always be above normal head height.

Shelving should, if possible, be placed in close relationship to both sink and cooker, but must not be in such positions that the user has to stretch across the top of a cooker. It is desirable that draining-boards and work-top surfaces should be 21in. wide, while 18in. should be considered to be the minimum width.

### Size and Shape

The kitchens are usually best if of rectangular shapes rather than square; and the lighting should be planned on a long wall.

In the past the floor areas have frequently been too small for comfortable working, and have not made possible the installation of a movable table. Tables are wanted not only for work such as the preparation of food, but also for uses such as ironing of laundry, as the folding ironing-board which is often installed is inadequate for larger articles such as sheets; the table is also useful for some meals such as early breakfasts or for lunch for one or two persons, and for which it may not be necessary to prepare the dining-room table.

Much has been said regarding the possibility of kitchens being too large and causing unnecessary fatigue due to walking from one piece of equipment to another, but there seems little possibility of this condition in dwellings of the housing type.

Medium-sized kitchens having comfortable space and correctly-related parts and fitments are more conducive to good working conditions.

### Storage Fitments

The minimum storage fitments for a house with three or fewer bedrooms should be a dresser or combination of upper and lower cupboards, 3ft. 6in. wide and the full height of the room, for the storage of china, glass, cutlery, etc.; a dry-goods storage cupboard 1ft. 9in. wide and at least 12in. deep and the full height of the room, and a broom-cupboard of similar dimensions. The dresser may usefully incorporate a hatch, if one is required (*see* B.S. 1195 —Kitchen Storage Fitments). Wherever possible, however, the number of cupboard fittings should be increased from the minimum given here, especially for the purpose of storing china, glass and utensils.

More particularly is an increase necessary in the storage fittings in rural housing where there is a likelihood of the need for plentiful storage for home-made produce such as jam, pickles, bottled fruit, etc., coupled with the probability that shopping is less frequently possible.

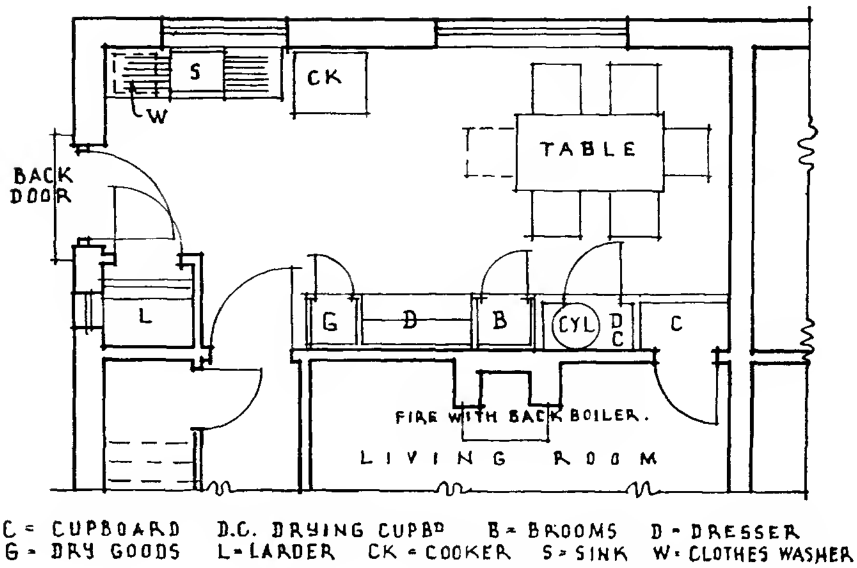



Fig. 18 Typical layout of a dining-kitchen

### Cookers

As has already been stated, the type of cooker varies very considerably according to the type of house layout adopted. In many parts of the country, especially near colliery areas, there is a preference for cooking by solid fuel; an open-fire combination range mentioned in connection with the living-room is unsuitable for working-kitchens or kitchen-dining-rooms, where the cooker should take the form of an insulated or semi-insulated type, working on the principle of continuous burning; such appliances provide sufficient heat to warm the room and, at the same time are more efficient than many older types of cooker. A type which has been used quite extensively is the " back-to-back " fitting, in which a fire in the living-room heats the cooking portion of the appliance, which is placed in the kitchen; this type of appliance has recently been greatly improved in efficiency and should be found economical in operation, but necessitates having a fire in the living-room all the year round: also it involves the planning of the flue on the partition between the living-room and the kitchen in such a way that the appliance is properly arranged for comfort and convenience in both rooms.

Gas and electric cookers are of two main types: firstly, the more common vertical type, with the boiling-top placed over the oven; and, secondly, the horizontal type, where the boiling-top and oven are placed side by side; the latter type requires practically twice the length of wall space necessary for the former, and it may be found difficult to accommodate such a fitting in small kitchens although the space below the oven and hot-plate is not lost but used for storage. It would generally seem better to avoid building-in any cooker as part of a continuous range of fittings, due to the difficulty of making the joint between the cooker top and the adjoining fittings so as not to permit the percolation of liquids. It may, therefore, be better to treat the cooker as a free-standing piece of equipment, with at least 3in. clear space on each side, to allow for cleaning the sides and to accommodate overhanging saucepan handles.

The types and sizes of cookers vary considerably in different districts, but a wall space of at least 30in. and preferably 36in., should be allowed; the projection from the wall varies in normal-sized cookers from 21in. to 24in.

### Wash-Boilers

Gas and electric wash-boilers are usually of a nominal 10-gallon capacity and require floor space of approximately 21in. by 21in., from which it will be noted that where these are to be placed under draining-boards, the latter should be 21in. wide.

### Refrigerators

Before the war, a number of small dwellings was equipped with small refrigerators having a capacity of about 1cu. ft. Such a capacity is not of great value for the three-bedroom house, and a capacity of about 3cu. ft. is desirable. Refrigerators having such a capacity can be installed in a space approximately 21in. wide, 24in. deep and 34in. high, which permits of installation under a draining-board, but such a position is undesirable, and it is better if a cupboard fitting similar to the broom cupboard is used in which the refrigerator can be placed at approximately eye level. It is essential that refrigerators should be placed in the kitchen and not in the larder owing to the heat generated in the operation of such appliances.

### Food Storage

*See* Part 1: Storage.

### Kitchen-Dining-Room

Kitchen-dining-rooms should be planned to provide comfortable space for the chairs to be placed round a table without interruption of any process of food preparation; it is more satisfactory if the grouping of fittings and furniture can be such that the room is virtually divided into two more or less equal parts. Fig. 18 illustrates a typical layout of a kitchen-dining-room. The larder is planned near the entrance and away from all heat units. The sink, draining-boards, wash-boiler and cooker are planned together. The dry goods, dresser and broom cupboard are grouped together between the cooking part of the room and the dining portion.

A drying cupboard containing the hot water storage cylinder is planned close to the back boiler in the living-room, to reduce the primary hot water piping to a minimum. Two windows are planned, one to light the sink and cooker, and the other to light the dining-table. A long rectangular room is likely to be the most satisfactory shape for kitchen-dining-rooms. It is desirable to plan the back door well away from the dining-table.

### Sculleries

Sculleries, as dealt with in this paragraph, should not be confused with working-kitchens; the term has frequently been applied to the latter. In housing, sculleries are usually provided only for dwellings of the kitchen-living-room type and not where there is a working-kitchen or kitchen-dining-room, or where the kitchen is planned and equipped as a self-contained unit. The floor area of the scullery should be at least 50sq. ft., unless it is to be used also for laundry work, when the floor area should be increased to 65sq. ft. to 80sq. ft.; areas such as those suggested here are, however, small and should be increased wherever possible. The scullery should be planned to provide space for a sink and its draining-boards, a work-top or table, a broom cupboard and some general storage, together with summer or auxiliary equipment for cooking and water-heating by gas or electricity, as available, or, alternatively, in rural areas, by oil fuel. Sculleries to be used for laundry work need the same appliances with the addition of a wash-boiler, ironing-board and drying-rack and possibly a drying-cupboard. As an alternative to the wash-boiler, space should be allowed for a washing machine, which will probably be a tenant's fixture not provided by landlord or builder.

No provision should be made for meals to be taken in sculleries as their function should be confined to washing-up, food preparation and, if necessary, laundry-work. The back door of the house should lead into the scullery and not into the kitchen-living-room.

Lighting conditions, both by day and night, in relation both to the room and the placing of the equipment, should be similar to those outlined for the kitchen. At least one electric plug point should be provided for small equipment such as an iron, a mixer or toaster. Fig. 15 earlier in this section illustrates a typical layout for a scullery attached to a kitchen-living-room.

### Back Entrance

This entrance is often planned to give direct access into the kitchen, but it is advantageous to avoid this method, if possible. The usual plan is similar to that shown in Diagram A in Fig. 19, though the screen wall adjoining the sink is often omitted and the window and door constructed to form a single unit; the addition of the screen wall as shown and especially if an inner door is used, greatly assists comfort and working conditions.

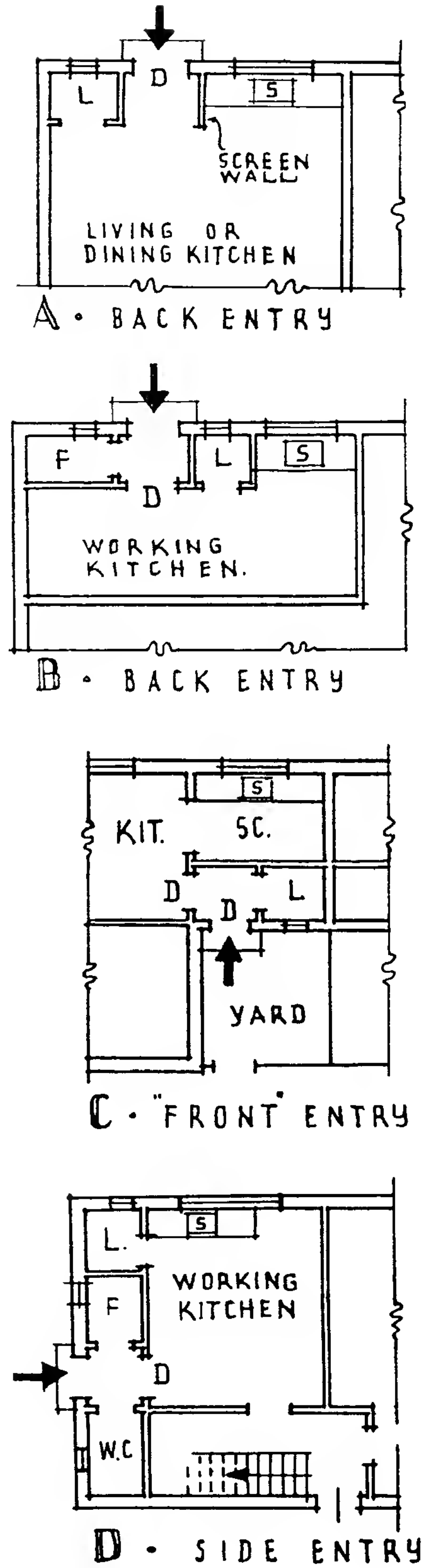
Back doors should not be less than 2ft. 6in. wide and are better if 2ft. 9in., and should be planned so that the open door screens direct draught from the sink and any fuel-burning appliances. The very common arrangement of grouping door and window in a single unit is undesirable and makes the hanging of curtains very difficult.

When a covered recess can be planned at the back entrance it is very advantageous, especially if such access is first to a scullery or utility room, where dirty boots and wet clothing may be removed before entry into the house.

Diagrams B and D of Fig. 19 show the formation of recesses at the entrance and giving access under cover to the fuel store, and also in Diagram D access to a ground floor W.C. which is only semi-external. It may often be found difficult to adopt a plan as shown in Type B, as the kitchen tends to become very long and an additional end window is really desirable to ensure adequate light. Glazed doors on the inside of recesses as shown do not give much extra light to the room.

The plan shown in Type C necessitates a long frontage, but as already mentioned, is a method of avoiding through passages for access to the kitchen. Such a plan greatly assists the comfort of the kitchen, provides a larder which is separated from the warm atmosphere of the kitchen and consequently provides better conditions for food storage. Type D is only applicable to detached and semi-detached houses and end houses of blocks.

An external lighting point is very useful at back entrances, especially if it can be placed to light the approaches to outbuildings and fuel stores.




KEY

D—doors
S—sinks
L—larders
F—fuel or garden sheds

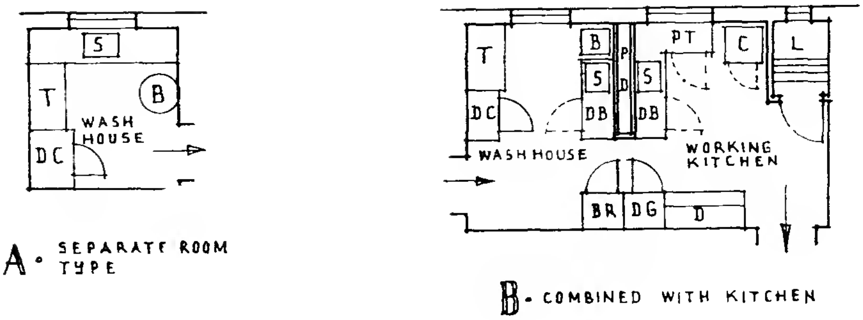
Right: Fig. 19 Types of back entrance

### Utility Rooms

This title embraces mainly what has generally been known in the past as the wash-house. There are two alternative positions for utility rooms; adjoining and possibly directly approached from the kitchen and as an outbuilding approached externally, either connected to the main building or as a unit grouped with the garden shed and/or fuel store; there are some advantages in treating this room as an outbuilding in order to keep away heat, dampness, steam and smell of laundry work away from the house; but against these advantages water-supply services to the sink may become more complicated, especially in regard to hot-water supply. The provision of a utility room must, to some extent, duplicate equipment provided in the house, although appliances more correctly designed for special operations may be possible, for example, a laundry-tub instead of a sink. It is, however, questionable whether costs and floor areas will permit of the installation of separate utility rooms or wash-houses in dwellings which have to be subsidized to provide rentals within the lowest range of incomes.

Utility rooms require a floor area of at least 40sq. ft. and are very much more satisfactory if increased to about 60sq. ft. to give adequate space for equipment and correct layout. The room is likely to have a variety of uses such as laundry, workshop and storage for wet-weather clothing. The only fixed equipment needed is that for laundry work, but it is advantageous to leave space for a small bench suitable for odd jobs of wood and metal work, boot cleaning and repairs and the like.

Laundry equipment should comprise a wash-boiler or space for a washing-machine; one, or better, dual wash-tubs with wringer attached (unless it is part of the washing-machine) and one or more draining-boards, preferably 3ft. run or more; a clothes drying-rack suspended from the ceiling and possibly a drying cupboard. There should also be an ironing-board with a suitably-placed electric- or gas-point for the iron and, if space permits, a table for ironing the larger pieces of laundry. Great care should be taken when planning the ironing-board to ensure adequate circulation when it is in the " in-use " position. Good light at the tubs is essential and special care should be taken to ensure good and adequate ventilation for the removal of steam. If solid fuel is used for heating the wash-boiler, the planning of the room must be controlled by the suitability of position for the flue.




KEY

S—sink
T—table
B—wash boiler
DC—drying cupboard
BR—broom cupboard
PD—plumbing duct
PT — food-preparation table
C—cooker
DG — dry-goods cupboard
L—larder
D—dresser

Fig. 20 Separate and combined utility rooms

Drying-cupboards, when provided may be either of the fast- or slow-operating types: the first requires gas or electricity for rapid heating, together with good ventilation, preferably direct to the open-air; the slower type may be heated from a hot-water coil connected to the domestic hot-water supply. It is said that to accommodate the week's laundry of an average size family, the drying-cupboard needs to be about 9sq. ft. in area and 6ft. 6in. high; it should have a series of rust-proof rods fitted at about 3ft. 6in. above the floor and near the ceiling. If the drying-cupboard is for the drying of wet clothing and not laundry the size need not be more than 2ft. 6in. by 18in.

Sinks for laundry work should be about 27in. by 15in. by 8in. (or, the normal 30in. by 18in. by 10in. fireclay sink) and tubs are usually 24in. long, 21in. from back to front and 15in. deep (*see* B.S. 1206 and B.S. 1229). Wash-boilers require an area of approximately 21in. by 21in., and similar dimensions will accommodate some types of washing-machines, but others need somewhat larger spaces (*see* B.S. 1183 and B.S. 1250). Wash-boilers, whether electric, gas, or for solid fuels, should be of the nominal 10-gallon capacity. Fig. 20 illustrates two typical utility rooms or wash-house layouts indicating the desired relationship of the various pieces of equipment to one another. Diagram A shows the room either as part of the house or as an outhouse. The sink or tub is placed on an external wall for simplicity of services. The wash-boiler may, in either type, be replaced by a washing-machine. Diagram B illustrates a type of utility room combined with or attached to the kitchen in which the sinks are placed back-to-back separated by a duct for all the plumbing services; it should be noted that the wash-house in this type is used also for storage of brooms and similar utensils and also serves as an entrance lobby to avoid direct external access to the kitchen. A door may be introduced if complete separation of the wash-house from the kitchen is required.

### Bedrooms

Bedrooms should have direct access from landings or corridors and should in no circumstances be intercommunicating.

Floor areas should be:

First bedroom: At least 135sq. ft., and better 150sq. ft., allowing for two persons, together with space for a baby's cot.

Other double bedrooms: Not less than 110sq. ft., and preferably rather more.

Single bedrooms: Not less than 70sq. ft., and better, not less than 80sq. ft.

These areas are usually measured inclusive of built-in cupboards and chimney-breasts.

Some authorities suggest that in the normal three-bedroom house there should be little difference in area between the two larger rooms and that the smallest room should be much larger than has been general in the past. The shapes and sizes of the rooms depend very much on the placing of the essential furniture and equipment and, particularly, the relationship of the bed to windows, door and fireplace, to avoid the bed being in a draught and, where possible, to avoid facing the light. Fig. 21 illustrates typical layouts of bedrooms based on the average of the areas given in the Housing Manual, 1944. Diagram A shows the principal double bedroom. Diagram B is typical of double bedrooms other than the largest bedroom, and Diagrams C and D are single bedrooms alternatively with long and short window walls for the same floor area.

### Bed-sitting Rooms

There is a school of thought which suggests that, owing to the limitation of space in many houses, certain of the bedrooms should be planned and equipped as bed-sitting rooms. If this suggestion is to be adopted, special consideration should be given to the floor area, of which such a large proportion is generally occupied by the bed and circulation space. This dual use of rooms will probably involve different provisions in regard to heating and lighting.

### Furniture

The dimensions of bedroom furniture are given in Part 1: Furniture.

### Windows

Windows should be planned wherever possible on a long wall. Window areas are controlled by statutory requirements; excessive areas of window should be avoided in order to provide adequate wall space for furniture and to avoid undue heat-loss.

Sills should be kept rather higher than in living rooms, and the window heads should be as near the ceiling as the lintel or eaves permit. Statutory requirements in most districts ask that the opening should be at least 6ft. 6in. above the floor. Bedrooms need not be more than the statutory minimum height, which is 7ft. 6in. in almost all districts.

### Layout

Fig. 21 shows positions for fires, but only in the main bedroom, Diagram A, is a solid-fuel installation suggested. The figure shows gas fires, but this is to indicate either gas or electric fires, preferably with ventilation flues of at least 30sq. in. area. In Diagram A the fire is suggested as being planned in the spine wall, as this tends to permit of better planning than when the fire is in the party wall. It should be noted that in single bedrooms of minimum size it is almost impossible to plan the bed except with a long side against a wall if adequate circulation space is to remain; it should be noted that no cupboards are shown in the single-bedroom diagrams, as it is usually necessary to plan these flush with the walls.

### Storage

All bedrooms should be provided with built-in cupboards, allowing as a basis at least a 2ft. run of hanging space per person, and it is better if longer lengths of cupboard can be provided, giving partly hanging and partly shelf space. Cupboards should be 1ft. 10in. deep (1ft. 9in. in the clear) and should be 6ft. 6in. high, with extra cupboards above reaching to the ceiling

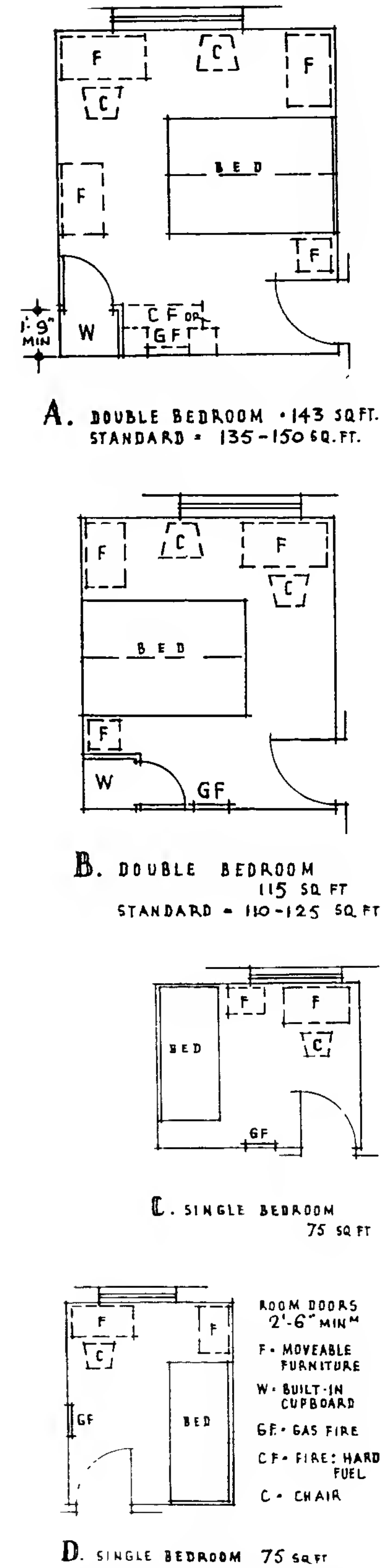



Fig. 21 Single- and double-bedroom layouts

for the storage of the less frequently required articles. The provision of adequate built-in cupboards is more economical in floor-space than the provision of equivalent areas of storage in the form of loose furniture. By careful planning of cupboards, the partition between two rooms may be formed entirely of such cupboards.

### Placing of Bathrooms

The position of the bathroom has considerable effect on the general planning of small dwellings. In urban areas, except in certain special cases, determined by occupational requirements, this room is preferred on the upper floor, but in houses in many rural districts there are advantages in providing a ground-floor position. It will also be found that in some types of plan, especially those with kitchen-living-rooms, there is insufficient accommodation on the ground floor to provide minimum bedroom areas above unless the ground-floor rooms are made unduly large; in such instances the ground-floor bathroom may be found suitable.

Any increase in the number of bedrooms over three does not need a proportionate increase in ground-floor area, although some increase is desirable, and consequently one of three alternatives may be adopted: firstly, to put the bathroom on the ground floor; secondly, to plan one or more bedrooms on the ground floor; or thirdly, to form a second floor by an extra storey, or by planning rooms in the roof-space when pitched roofs are adopted.

### W.C.s

It is desirable that two W.C.s should be provided in houses having three or more bedrooms; this would seem only really necessary, however, in three-bedroom houses if fully occupied by five persons.

The second W.C. is likely to have considerable influence on the planning of houses. It is suggested that where two W.C.s are provided, one should be placed in the bathroom on the first floor and the other on the ground floor; if the bathroom is planned on the ground floor, as may be necessary in some schemes for the reasons given above, the logical corollary would be to plan the second W.C. on the upper floor; but this may prove as difficult as for a bathroom. It is desirable that the second W.C. be planned within the building, but this may also be somewhat difficult in terraces or blocks of houses, and an outside position may have to be used, with risks of freezing in winter unless cost-adding precautions are taken. It is suggested by medical authorities that a lavatory basin should be installed in every W.C., which increases the space required and may prove difficult to plan in conjunction with the hot-water service. In long-frontage terrace houses it is easier to provide an inside ground-floor W.C. approached from the entrance hall; the use of end external walls of pairs or single houses also facilitates a solution of the problem.

### Sanitary Ware

For the dimensions and layout of sanitary ware, *see* Part 1: Sanitation.

### Upper Floors

The staircase, which has already been discussed in Part 1, usually leads to a landing and/or corridor, giving access to all bedrooms, bathroom, W.C., linen cupboard and any general storage space. Care should be taken not to restrict the turning-space at the head of the staircase or to cause other difficulties for the handling of furniture. Landings and corridors should not be less than 2ft. 9in. wide and the total area should be as little as possible in houses having small total floor areas, in order to obtain the maximum floor space for the rooms. Landings and all doors to rooms should have reasonably good lighting, both by day and night, but it will be found that when semi-detached or terrace houses are planned on narrow frontages it is not always possible to provide direct daylight and the introduction of glazed fanlights over room doors may then become necessary.

### Access to Roof Spaces

Roof spaces are normally used for the accommodation of the cold-water supply cistern and sometimes for general storage, and fairly easy access should be provided, either by means of a ladder or a " loft-ladder " through a trap-door in the ceiling of the landing or corridor; this access should not be planned from a bedroom. Care should be taken to ensure that the size of the access trap is sufficient to permit of the replacement of the cold-water storage cistern, which is approximately 2ft. 6in. by 2ft. by 2ft. for 50-gallon capacity, and 3ft. by 2ft. 6in. by 2ft. 3in. for 80-gallon capacity (*see* B.S. 417).

### Structural Standards

There is a number of structural factors and building components which, although not strictly matters of planning, have much influence on the plan and the work of the architect when he is designing dwellings; it is therefore proposed to give a number of short references to some of the subjects which may have direct effect on planning of housing.

Consideration should be given to the improvement of thermal insulation for houses to reduce heat losses, which have been unnecessarily high in many forms of construction used in the past. Increased sound insulation, especially in regard to party walls, should also be given careful study. Maintenance, which tends to be very costly, should be borne in mind constantly during the designing and in the selection of methods of construction, materials and finishes. Very much helpful information on improvements and economies in structural design is given in the " Housing Manual, 1949," together with its " Technical Appendices."

### Doors

Doors should be hung to screen rooms but also so that they do not incommode the use of the room. Main rooms should have doors at least 2ft. 6in. wide, but a slight increase for living-room doors and doors to kitchens is advantageous. Doors to bathrooms, W.C.s, stores and the like may be reduced to 2ft. 3in. or even 2ft. wide. A height of 6ft. 6in. should be provided for all internal doors to rooms, but greater heights are unnecessary (*see* B.S. 459). If large openings are provided between rooms these may be fitted either with pairs of doors or

folding screens; sliding doors usually should be avoided, as they require either a recess into which to slide when open or need too much wall space; it is better to avoid the use of pairs of doors with leaves greater in width than 3ft. due to the strain on the hanging edge and to the difficulty of providing space to fold back the doors when open. Sliding doors for normal-sized openings may save space, but are undesirable owing to heavier maintenance and the risk of catching fingers between the door and the closing frame.

There are two main internal door types, panel and flush; it is probable that the former will remain less expensive to install but the latter is more easily cleaned, although tending to show surface damage more readily.

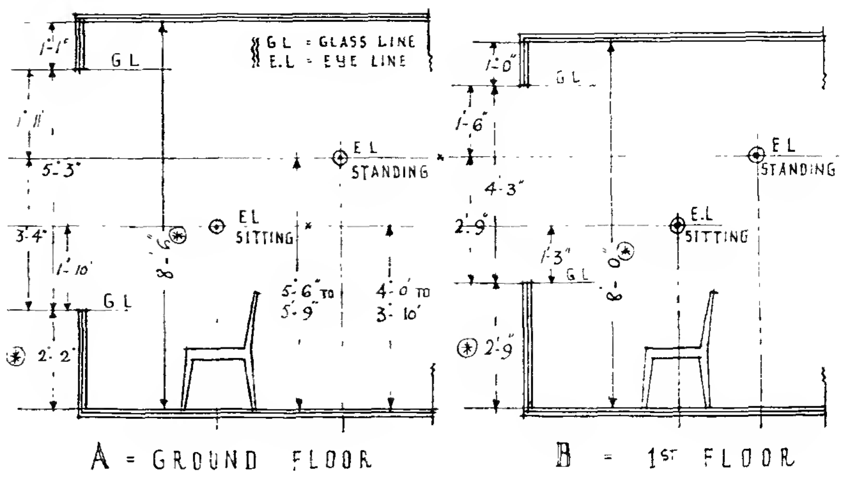



Fig. 22 Dimensional data for windows

### Windows

The merits of the various types of window are largely matters of personal preference. British Standards are available for both wood and steel windows in a wide variety of types (*see* both B.S. 644 and B.S. 990). Local by-laws fix a minimum area of window in relation to the floor area of rooms and lay down a proportion of the window which must be made to open; it is doubtful if there is any scientific reason for this proportion, which usually amounts to one-tenth of the floor area. Half of this area must be capable of opening. This rule is simple to apply from the point of view of the designer and for administration of the by-laws, and has not, on the whole, proved to be inadequate. Full information on desirable window areas from a more scientific aspect is given in the Report, "Lighting of Buildings," Post-War Building Studies No. 12 (H.M.S.O., price 2s. 6d.) Window areas must be weighed carefully against heat losses unless inexpensive forms of double-glazing become generally available.

In choosing window types careful consideration should be given to the means of installing curtains and, in fact, it would seem wise for housing authorities to provide some equipment for the avoidance of damage which often arises from the fixing of fittings by tenants. It is difficult to fix curtains to inward-opening types of window satisfactorily. It is relatively easy to fix curtain rods or tracks to wood-framed windows, but consideration should also be given to the making of adequate provision for curtain fixings in lintels, especially when these are of concrete (*see* B.S. 1239), as it is undesirable that curtains, excepting lace or net, be hung close to the glass surface.

Both wood and steel casement-type windows of the sub-light types having a fixed portion adjoining the window-board below the opening sashes are available; this fixed portion allows articles to be placed on window-boards without risk of being knocked out of the window when open; this type is particularly useful for the upper floors of blocks of flats.

It has frequently been suggested by some authorities that something greater than the usual standard of 10 per cent of the floor area of each room should be allowed for the area of windows, and the figure has been put as high as 20 per cent and even higher. If areas such as these are considered necessary, they limit considerably the possible arrangements of furniture within the rooms. Generally windows should reach as near to ceilings as possible, allowing for curtain fixings and pelmets; tall narrow windows give better lighting than long low windows of equal area.

Fig. 22 illustrates some points in regard to common maximum heights of glass lines above floor levels, namely, 2ft. 2in. on ground floors and 2ft. 9in. on bedroom floors. These heights enable seated persons to see out easily; windows may be brought down to skirting height in ground floor rooms overlooking gardens. The figure shows that the eye-level of the average person when seated is about 3ft. 10in. to 4ft. above the floor, and from 5ft. 6in. to 5ft. 9in. when standing. Care should be taken to avoid the frequent fault of placing the transom dividing top-hung from side-hung sashes so that this eye-level is interrupted. The figure also shows the approximate amount of glass height available in rooms of normal heights; this is arrived at by allowing about 12in. or 13in. between the top glass line and the ceiling, in which space has to be placed the sash and frame of the window, together with the lintel. Some top-hung lights in windows seem to be a popular feature, and by their introduction it is probably easier to ventilate the room in hot or wet weather, though the same points are equally true in regard to double-hung sash windows.

### Cooking, Heating and Hot Water

Frequent references have been made throughout this section to types of appliances; it cannot be stressed too greatly that fuel appliances have a very important influence on planning, and types of appliance suitable for one plan are quite misplaced in other forms of plan.

Local conditions, such as proximity to mines, local customs and relative prices of fuels, influence the type of appliances preferred in any particular district. Generally the fuels used are inter-related and it is difficult to consider the use of each separately in any dwelling.

The whole subject is discussed in the "Housing Manual, 1949," particularly in Appendix F thereof.

It is now essential that constant hot-water be provided in all dwellings to the sink, bath and wash basin, whenever an adequate supply of water permits; this is general, except in very isolated rural areas. Hot-water supply by means of a copper must now be considered as obsolete. In houses it is undoubtedly most economical to use solid fuel for water heating, except in dwellings having very small accommodation, although it is often desirable to install alternative appliances for auxiliary and summer use. Water heating and cooking are often combined when solid fuel is used for cooking; water heating is also combined with the living-room heating in many dwellings by the use of a back-boiler to an open fire or, better, an openable stove. The use of the small independent boiler has greatly increased where a fuel other than solid fuel is used for cooking, but it is as yet uncertain whether this appliance is sufficiently economical for use in housing for the lowest income groups, with the addition of a fire in the living-room. In the past hot-water services have often been very inadequate, both in regard to quantity and temperature, while the fuel consumption has often been very high in relation to the result. The storage vessel, whether a cylinder or tank, should provide for a minimum of 30 gallons. It is very desirable that indirect systems be used, especially in hard-water districts and where towel rails or radiators are required; any additional first cost is likely to be offset by low maintenance costs. Full consideration should also be given to the installation of adequate quantities of thermal insulation on pipes and on storage vessels to reduce thermal losses. Very considerable development in types of appliances is now taking place which should lead to more efficient use of fuels; the appliances may be greater in first cost, but this should be very quickly offset by reduced running costs, increased efficiency and, in the case of solid fuel appliances, reduced smoke emission, and by less work for the housewife.

### Cold-water Services

Although in many areas it has been customary to serve many fittings directly from the main it is desirable that a cold-water storage cistern, having a capacity of at least 50 gallons, should be installed from which to feed all cold-water outlets, except one directly off the main, for drinking water, which is usually placed over the sink; a cistern ensures even pressure and a storage supply should the main supply fail temporarily. The cistern, together with all cold service pipes, should be planned to avoid risk of damage by frost, and where exposed (as in roof spaces) they should be protected; this is simple to achieve and the cost small in comparison to the costs so frequently incurred in maintenance.

### Garbage

This remains a problem which has by no means been solved satisfactorily, especially in housing schemes of a spread-out nature. The dust-bin remains as the only practical solution, and this should be considered more carefully than has often been the case in the past, when many have been too flimsy to withstand the constant and very rough wear to which they must of necessity be subjected (*see* B.S. 792). The placing of the dustbin should be given proper attention as part of the planning of the out-works of houses. (*See also* Part 1: Refuse.)

### External Sheds

It has become customary to provide an outbuilding or garden shed for all houses in housing schemes. It is possible to incorporate the sheds as a planned part on the total design of an estate and so, to a large measure, avoid the occurrence of unsightly and sporadic additions erected by tenants.

In urban schemes, the shed should have a floor area of at least 50sq. ft., but in rural areas it should be increased to at least 85sq. ft. This store should be dry, windproof, and provide reasonable protection against frost, although complete frost protection is, of course, impossible unless heating is available. The garden shed is often grouped with the fuel stores and the wash-house, if the latter is planned as an external unit; it may be necessary, although undesirable, to include the second W.C. in this group.

Fig. 23 on page 94 illustrates a typical grouping together of the outbuildings for a pair of houses of an urban type on narrow frontages. The group consists of two garden sheds and two fuel stores which are placed on the line of the party fence, and so arranged that the approaches to each owners' sheds are separated and each property cut off from the common entrance by its own separate gate.

Sheds should be at least 6ft. 6in. across in order to accommodate a bicycle. Paving at least 3ft. wide should lead to every door, and this should be extended to provide a dry area near the back door.

Sheds should be at least 6ft. 6in. high to the lowest part of the roof. Doors of sheds should be at least 2ft. 6in. wide to allow for the entrance of a garden barrow.

Fig. 24 illustrates types of outbuildings primarily applicable to rural schemes designed on wide frontage sites, but these would be equally applicable to urban houses where site conditions permit of their use as alternatives to the layout which is illustrated in Fig. 23.

In each type shown in the diagrams of Fig. 24 the minimum area for the combined store shed and fuel stores is 100sq. ft. This area must be increased if a wash-house is to be incorporated in the group.

Diagram A shows a detached type planned in the back garden in a somewhat similar position to that shown in the top diagram, but the houses are planned sufficiently far apart so that the end wall of the houses and the outside walls of the combined outbuildings are approximately lined-up, thus avoiding the need for the kitchen to look out

directly on to the end wall of the outbuildings. By placing the sheds of each house side by side, very much more fuel space can be provided and separate approaches with back-gates from the road can be planned, thus eliminating the necessity for a narrow covered passage-way.

Diagram B illustrates a type in which the outbuildings are grouped with a wash-house and the whole attached to the house as a single-storey link between two houses; it is necessary with this plan to provide access to the back garden which, for appearances, may be included under the roof as a covered way, giving access to separate gateways to each garden. The plan shown has the second entrance or "back door" on the main frontage leading into a lobby, from which the kitchen, wash-house and fuel store are approached. The fuel storage is by this means accessible internally, but it is so planned as not to cause unnecessary dirt in the house itself. The lobby also forms a cut-off or ventilation lobby between the wash-house and the kitchen. The shed is directly approached from the garden with which it is most used.

Diagram C uses the outbuildings and, if required, the wash-houses also, as a connecting link between the houses; outbuildings are detached but may be arranged to provide continuous wall and roof between the houses with gateways leading to the "back doors" and gardens. Such a plan gives narrow economical spans for the roofs of the outbuildings. It should be noted that in all the diagrams, paving is provided to give dry access to the doorways of all outbuildings.

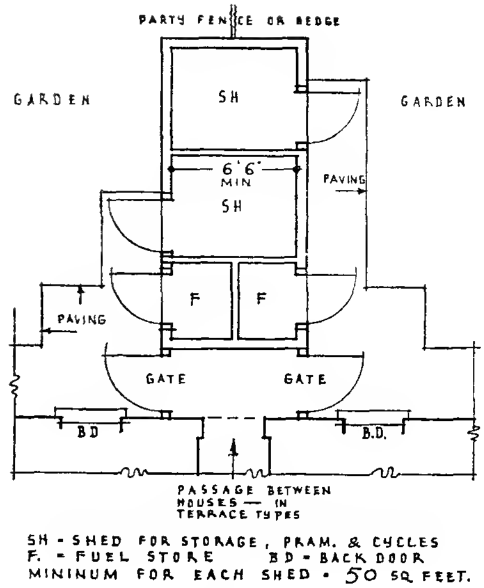
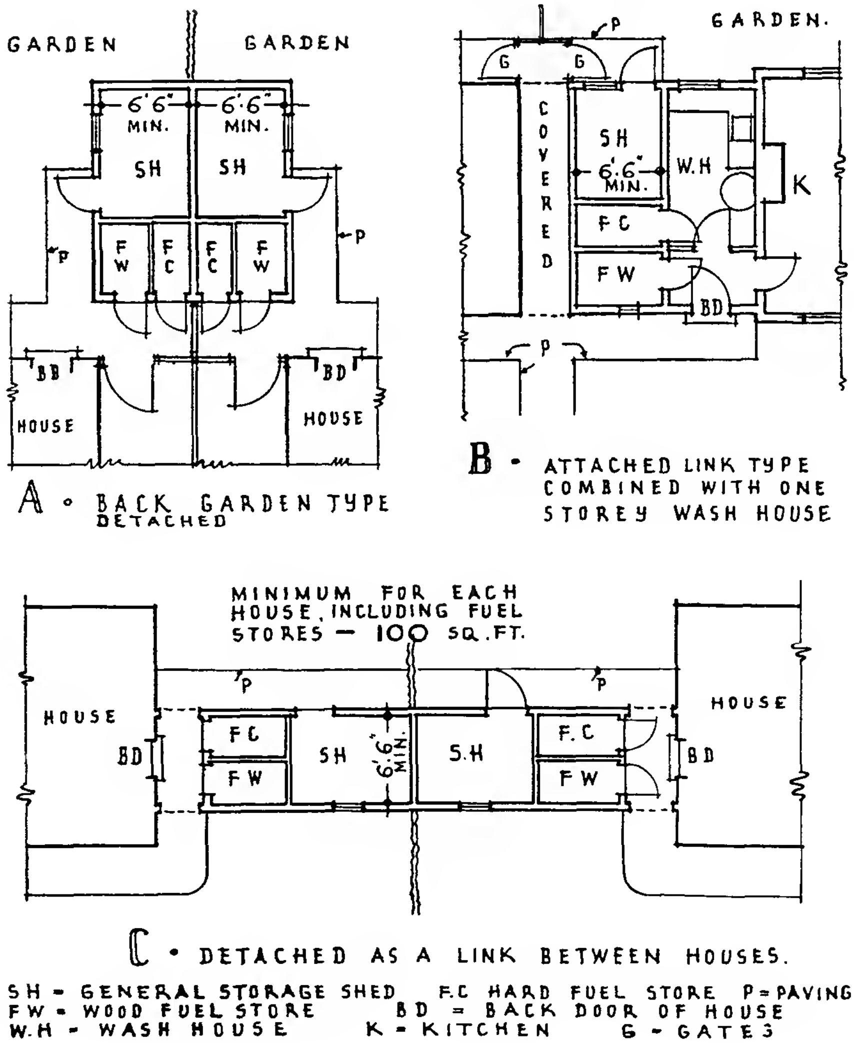



Fig. 23 External sheds—urban




Right: Fig. 24 External sheds—rural

### Duplex Planning

This term is used to describe a two-storey building which is designed for immediate use as two flats, with the ultimate aim of converting the total accommodation to a single house at some future time. This form of planning, except possibly as a very exceptional emergency measure, is quite unjustifiable on many grounds; firstly, it is quite unlikely that the conversion will ever be made if the two flats are satisfactory as flats; secondly, if the plan provides two satisfactory flats the area is likely to be excessive for a single dwelling; and thirdly, the rental for the house will probably be less than the combined return on the two flats after considerable cost has been expended in the conversion.

Undoubtedly the most important objection is the one first named above, namely, that the conversion is most unlikely to take place, as the cost and trouble involved will seem too great to warrant the change, and the ultimate result is that two not altogether unsatisfactory dwellings will remain for the duration of the life of the building.

### Flatted Dwellings

This description applies to small blocks of two-storey flats similar in appearance to semi-detached or blocks of four houses. This type of dwelling has been much used and appears to be very popular in Scotland, but it does not appear to have been so much used elsewhere. Each dwelling, unlike a flat in a block, has its own independent entrance from the street. It is more or less a compromise between a house and a larger block of flats, and has few of the advantages of houses and some of the disadvantages of flats.

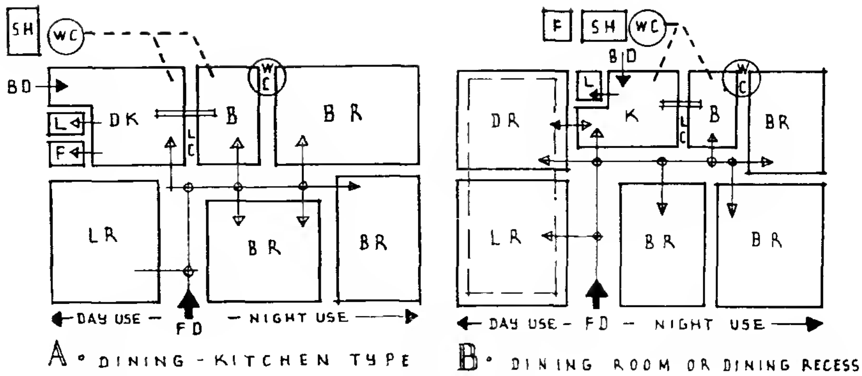
Floor areas needed tend to be larger than for houses providing similar accommodation owing to the need to increase the area devoted to access. The construction has to be similar to that adopted for flats, especially in regard to sound-deadening between the two storeys; thus the cost is likely to be greater than for houses, offsetting any advantages otherwise gained.

The general planning and the relationship of rooms should be similar to those adopted for flats, and special consideration given to the sharing of garden space equally between each occupation. Fuel facilities for upper floor dwellings should be within the house and not in the garden. As in flats and bungalows, living-rooms and kitchens should be grouped together, with the bedrooms forming another group; since a combined bathroom and W.C. is usual it should be conveniently planned for use with both groups of accommodation.

### Bungalows

The possible use of single-storey construction has already been mentioned, and there is a number of householders who like this form of dwelling. It is a type which can only be justified where land costs are low, as in rural areas. The planning of bungalows needs very careful thought in order that separate groups of accommodation be allocated for day and night use so that the living-rooms and kitchen should form one part of the plan and the bedrooms another. Living-rooms should not be used for direct access to bedrooms; bathrooms should be associated with the bedroom group, but it is desirable that they be so placed as not to be too difficult of access for the day accommodation. It has always been questionable whether bungalow forms of construction are economical owing to the relatively large amounts of external wall, roof and foundations.

Fig. 25 shows a diagrammatic analysis of bungalow planning and makes clear the relationship of the various parts to one another. The front door should give easy access to the rooms used in daytime and, as far as possible, the rooms for night use should be grouped round a corridor or hall space leading from the main entrance hall and screened from the entrance itself. Otherwise the relationship of rooms should be similar to that normally adopted for a two-storey house. Fig. 25 illustrates the analysis of two different types of accommodation, the one, Diagram A, based on the use of a dining-kitchen, the other, Diagram B, based on a dining-room in addition to the living-room, or a dining-recess as part of the living-room, with the kitchen as an independent room. In both diagrams the living-rooms, kitchens and larders are grouped together with the bathrooms and W.C. (which may be combined or separate according to the size of the dwelling) between this group and the bedroom group. There is a further point in relating the kitchen and bathroom in order to keep hot-water services and drainage together.




Note: diagram is not related to aspect or room sizes

KEY

| | |
|---|---|
| LR—living-room | B—bathroom |
| K—kitchen | L—larder |
| SH—outside sheds | F—fuel |
| DK—dining-kitchen | FD—front door |
| BR—bedroom | LC—linen cupboard |
| BD—back door | ----drainage |
| DR — dining-room or recess | ⟹hot-water service |

Fig. 25 Analysis of bungalow planning

SPECIAL HOUSING

### Special Houses

Special accommodation for old persons eliminates the need for them to live with relations or friends. Provision of such accommodation is now recognized as a necessity in all new housing developments.

Old persons should not be segregated but should be provided for in general housing estates, so that they are near their friends. The special houses may take either the form of a group of houses in an estate, with possibly a communal room and accommodation for a nurse or warden to look after the more feeble or sick, or alternatively the houses may be scattered through the estate as small groups, or even single dwellings on the ends of larger blocks.

It is preferable that the siting be near public transport and not very far from shops. Sites should also be chosen with good aspects, and whenever possible a pleasant prospect, as old people are more tied to their dwellings.

The groups of accommodation may take various forms such as bungalows, flatted dwellings or two-storey blocks of flats, the upper level of which is approached from an open-air balcony. It is undesirable for buildings of more than two storeys to be used unless very easily operated types of lifts are installed. The accommodation should always be based on occupation by a married couple, although at times it may be occupied by a single or widowed person. The provision of one bedroom is usual, but consideration should be given to some dwellings with two bedrooms; this allows for a visitor and is useful in case of sickness. The essence of planning for old people should be simplicity in operation with the minimum of work and effort and operation at minimum cost.

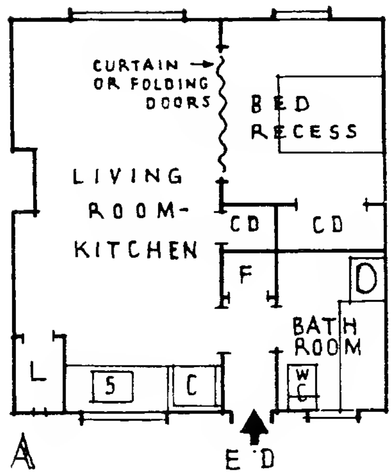
The minimum accommodation should be a living-room of at least 140sq. ft., a double bedroom of at least 120sq. ft., a small working-kitchen or kitchen facilities in space additional to that needed for living-room use, a combined bathroom and W.C., a fuel store and some general storage. The bedroom may either be separate or arranged as a bed recess, although it is very doubtful if the latter is at all popular, especially during illness; if the bedroom is separate it may be directly approached from the living-room. If living-rooms with bed recesses are used the total floor area should be not less than 230sq. ft. and any single bedrooms should be not less than 70sq. ft. to 80sq. ft. Both the living-room and the bedroom should have sunny aspects, as some old people have to spend much time in bed. Fuel should be accessible without need to go out of doors. Heating is of great importance in such dwellings, as it may be required almost continuously throughout the year, and also very frequently for 24 hours per day; solid fuel is likely to be the most economical form of heating. When groups of old people's dwellings are designed, serious consideration should be given to economy and reduction in labour by use of a central heating system. Cooking is probably most convenient by means of gas or electricity, as the amount is relatively small and intermittent in character. The living-room fire may advantageously be used for water heating.

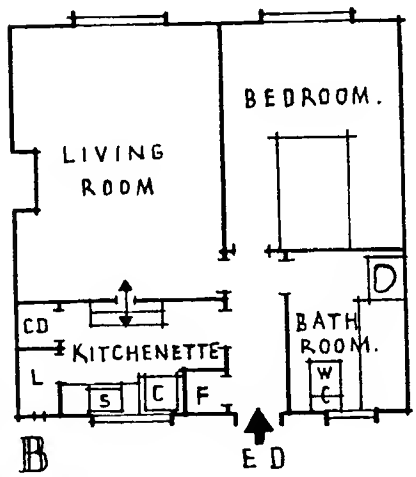
Old people often have difficulty in getting into and out of a normal bath, and a grip rail should be provided, but alternatively consideration should be given to the use of shower and sitz baths.

It is desirable to provide, in all larger groups, a community building to house a common-room with a tea-making annexe, sanitary accommodation and a reading-room with a small bookstore or library. The total room areas, excluding circulation spaces and sanitary accommodation, should be based on an allowance of 10sq. ft. per person for the maximum sleeping facilities of the group. Communal dining-rooms and kitchens are not required. Fig. 26 illustrates alternative typical plans of small dwellings suitable for old persons.

Diagram A shows a type using the bed recess and Diagram B a separate bedroom type. The former has a combined living-room-kitchen and the latter a separate kitchen.

The nurse or warden should be provided with a normal two-bedroom house or flat.




KEY
L—larder
F—fuel
S—sink
C—cooker
CD—cupboard
ED—entrance door

Fig. 26 Single-bedroom type dwellings for old people

### Single Persons

As already stated, the majority of single persons are likely to be housed either in hostels or as lodgers, but there is most certainly a call for a number of small dwellings for those whose incomes are sufficient to permit of maintaining a home of their own either alone or shared with one or more others. On many estates provision has also to be made for such persons as the district nurse, estate managers and others for whom accommodation such as that shown in Fig. 26 on the opposite page is suitable.

Hostel-type accommodation for old people is discussed in the section on " Residential Hostels."

The most satisfactory method of providing separate dwellings for single persons is most probably in the form of " one-room flats." (*See* section: " Small Flats.") The amount of accommodation likely to be most popular does not lend itself well to the building of houses, since the main demand is likely to comprise a living-room, a small kitchen, one, or at the most, two bedrooms, a bathroom and a small amount of storage space. Kitchens should be fully equipped for cooking, but on a small scale, which, in fact, means normal equipment such as a sink and cooker, but with reduced storage.

Heating and hot water are most likely to be needed on an intermittent basis and, if centralized services are not installed, are best met by gas or electricity, excepting that a solid-fuel openable stove with back boiler has the advantage of keeping the dwelling warm and dry when it is unoccupied for daytime periods.

### Other Special Housing

Housing having special planning and equipment is needed for various types of occupants such as doctors, district nurses and midwives and for disabled persons.

Nurses and midwives can be given adjusted normal three-bedroom houses, but it would seem better to design houses to suit their special needs. The essential additional accommodation is a visitors' or patients' entrance lobby, with a lavatory and W.C. compartment adjoining; a small waiting-room of about 70sq. ft. and a " district-room " of not less than 80sq. ft. and better at least 100sq. ft.; the " district-room " needs good daylight and should be equipped with a boiling ring and sink. A garage is also essential.

For disabled persons able to live at home with their families it is usually necessary to plan either all, or at least most, of the principal accommodation on the ground floor. Bedrooms for children can then be placed on upper floors. Blind persons are usually able to use normal houses.

Doors are easier for the disabled to operate if of a sliding type. W.C. compartments often need to be fitted with holding bars on both sides and with a ceiling grip. Bathrooms must be planned to allow wheelchairs to be drawn up close to the side of the bath and to the front of the lavatory basin which must be set higher than usual. Garages are usually essential and should be reached under cover; in order to permit a wheelchair to draw up at the side of the car they should be at least 10ft. wide. All steps at entrances should be avoided. (*See also* Part 1: Transport for dimensions of invalid chairs, etc.)

## THE HOUSE FOR THE INDIVIDUAL CLIENT

### General

The basic requirements for all types of houses have already been considered in this section. When designing for known clients additional requirements have to be taken into account and these are considered here.

### Single and Multi-storeyed Houses

There is much controversy as to the merits of single-storey houses as opposed to those having two or more floors. More area is covered by a bungalow than by a two-storey house giving similar accommodation; this naturally reduces the amount of plot available for the garden, an important consideration where land is expensive. Foundation and roof costs are much greater in bungalows. The space within the roof of a true bungalow is wasted except as storage. But the cost of staircases is obviated and services are facilitated.

### Aspects

The primary considerations in the planning of a house are the relationships of the aspects of the various rooms and the prospects dictated to the designer by the peculiarities of the selected site. Prospect is determined by the views desired from certain rooms of the house and may sometimes be at variance with the ideal aspect for the rooms. Due consideration should be paid to each of these factors, but preference should be given to aspect, which probably means greater comfort and health for the occupiers of the house.

In Fig. 27 the ideal aspects recommended for various rooms are shown superimposed upon a "sun range diagram," which gives the position of the sun at various times of each day and the times of sunrise and sunset at different times of the year, together with orientations.

### Entrances and Approaches

Access from the street depends very much on the individual site. Independent access to the main and service entrances of the house is preferable, thus separating visitors from tradesmen's deliveries. The access to the main entrance should be obvious from the street, while the service entrance is better screened from the main approach. The main approach in larger houses should allow vehicles to reach the main door and set down their passengers under cover. Such an arrangement is, however, frequently impossible if the sites are small. The possibilities of the vehicles being able to deliver directly to the service entrance are a great asset, especially for such goods as coal, oil fuel and garden requisites.

### Layout of the House

Planning is dependent on the proper relationship of rooms and of various services required by different rooms or portions of the house and, therefore, each problem should be analysed to show fundamental relationships and circulations. Fig. 28 shows such an analysis for a medium-sized house.

All houses, regardless of size or accommodation, may be worked out in a similar fashion. Analysis, of course, depends always on the incorporation of the particular requirements of the individual client. In the example shown there are two entrances: the main entrance to the house entering into the hall and the goods and service entrance attached to kitchen and service quarters. The hall should be regarded as a circulation space, whether it is used as an entrance vestibule only or as a lounge. It must be accessible from the kitchen quarters, so that the entrance door may easily be answered; from the hall should lead the main living-rooms and possibly the main staircase, which is the chief vertical circulation. If several living-rooms are provided, these must be grouped together as they are used in conjunction with each other. The living-rooms have to be related to the dining-room, as the owner's guests use these rooms in sequence. It may also be desirable for two or more living-rooms to be capable of being joined together by means of folding doors or collapsible partitions, to form one large room. The dining-room has also to be related to the kitchen for service of food, but the relation of the kitchen to living-rooms is less important, as there is less direct service between these two sections of the house. The kitchen and service portions, with subsidiary departments, such as larders, heating, etc., have to deal with the arrival of goods, cooking of food and service of food through the pantry to the dining-room. They must also connect with the maids' sitting-room and any minor vertical circulation (back staircase) for service in connection with the rooms on the upper floor or floors. The two vertical circulations will, of necessity, connect by means of a corridor on the upper floor, so that access may be obtained to all the rooms both by the maids and owners without the necessity of either using the other's staircase. The corridor type of circulation, therefore, becomes more apparent, a much more definite element, on the first floor than on the ground floor.

The placing of the rooms on the upper floors is important. The principal suites should be closely related to the main staircase; each bedroom may have its own bathroom and dressing-room closely attached to it, while the latter should, if possible, have direct access to the corridor as well as through the principal bedroom itself. Guests' bedrooms and those of other members of the family should be placed, with their bathrooms, as near the main staircase as can be conveniently arranged. Nurseries need access to both staircases, the main one for the use of the children and parents and the secondary one connecting with the service department for food and other services. Day and night nurseries should be grouped together for convenience. Day nurseries should not be placed over living-rooms, owing to the noise created in them, which is apt to be disturbing. Similarly, night nurseries are better if placed away from the living-rooms in which musical instruments may be played in the evening. The maids' bedrooms and their bathroom need not necessarily communicate with the other parts of the bedroom floors, but must have direct access from the service portion of the ground floors. The upper floor services, such as housemaid's closet and linen-room, although they are used in connection with every room, should be related to the service departments of each floor to aid staff work.

In smaller houses, where a secondary staircase cannot be provided, the problems should be given a similar arrangement, avoiding as far as

possible the unnecessary circulation of the servants through parts of the house chiefly used by the owners.

On the diagram in Fig. 28 the units requiring drainage connections are clearly indicated. As far as possible, all drainage should be concentrated for economy and where first-floor connections are required, these should, as far as possible, be over those on the ground floor.

### Main Entrance

The main entrance door should open, if possible, into a vestibule, or at least a small draught lobby, to protect the hall, especially if it is used as a lounge-hall. The lobby also allows a maid the opportunity of speaking to callers before admitting them into the house proper. In the draught lobby or vestibule should be placed the door mat, standard sizes of which are:—
24in. by 14in.; 27in. by 16in.; 30in. by 18in.; 33in. by 20in.; 36in. by 22in.; 39in. by 24 in.; 42in. by 26in.; 45in. by 28in.; 48in. by 30in. The depth of the sinking or well should be 1½in. and ½in. should be added to the mat sizes for the dimensions of the actual well.

A ground-floor cloakroom is a virtual necessity in all houses except those of minimum dimensions. The lavatory basin and W.C. are very frequently placed together in one apartment, which may also provide some accommodation for hats, coats, etc. It seems generally more satisfactory if the lavatory basin, W.C. and cloak spaces are all grouped together rather than separating the latter, especially for the use of visitors. Clothes are, however, in some instances provided for by a fitting in the hall itself, which in a small house permits of a more economical general plan. In a larger house the lavatory basin and cloak space are often combined, with the W.C. placed in a separate compartment, leading from the lavatory; urinals are seldom provided except in very large houses. Occasionally three separate rooms are provided and access from the hall is directly on to the cloakroom, from which open the lavatory and W.C. compartments.

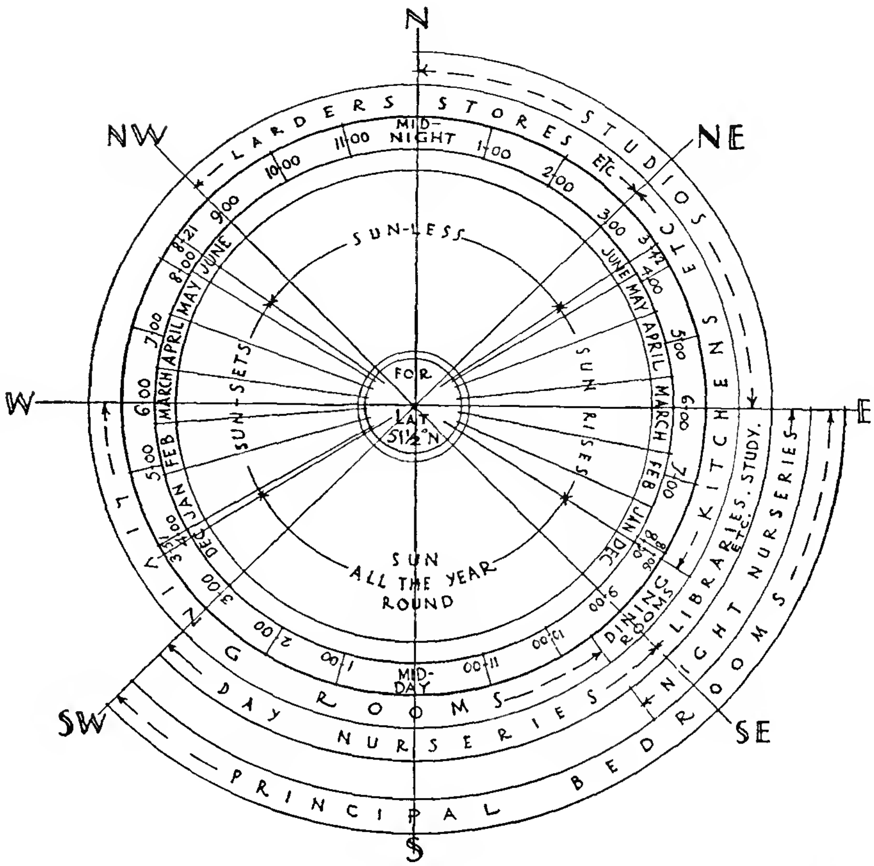
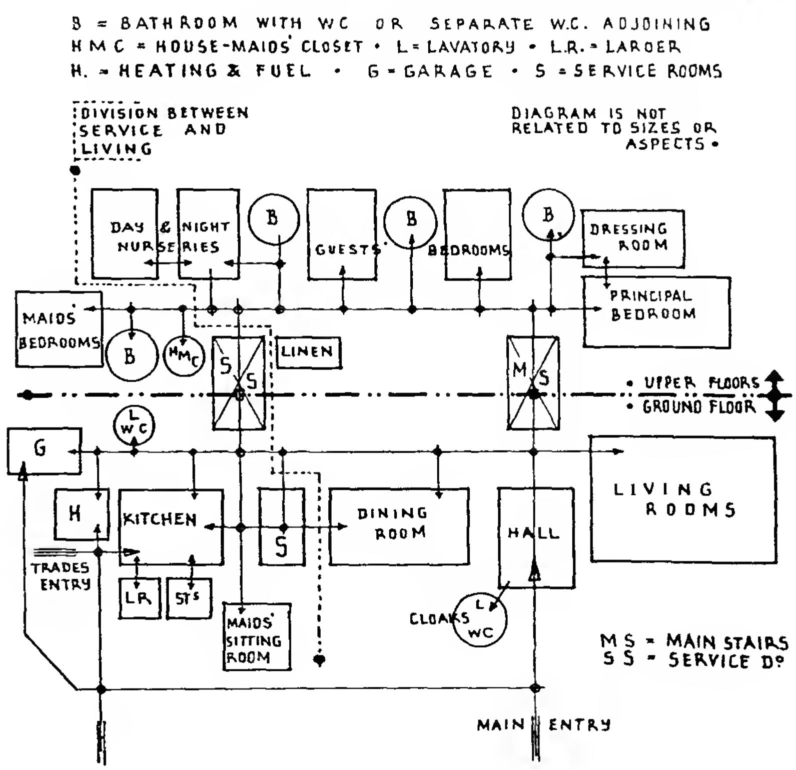



Fig. 27 Recommended aspects in relation to the sun




Right: Fig. 28 Diagrammatic analysis of domestic planning

### Cloakrooms

Cloak accommodation, whether forming part of the lavatory or separate as a fitting in the hall, has to store many and varied articles besides coats and hats, many of which are suggested, with average dimensions, in Fig. 29. The majority of the articles suggested need some storage space in most houses and economy of space can only be achieved by use of specially designed fitments. As a general rule, umbrellas stand in a watertight metal tray through a grid fixed about 2ft. above it; the grid needs spaces about 3in. by 3in. Hats require shelves 13in. wide to accommodate hats if placed end-on, or 10in. wide if placed lengthways; hat shelves should be 7in. or 8in. apart. Coats, although sometimes hung on hooks, should be placed on proper coat-hangers, for each of which is required a space of at least 1ft. 10in. by 3in. for men's coats; 4ft. 8in. from the centre of the hanger rod to the bottom of the coats must be allowed, but more for women's coats.

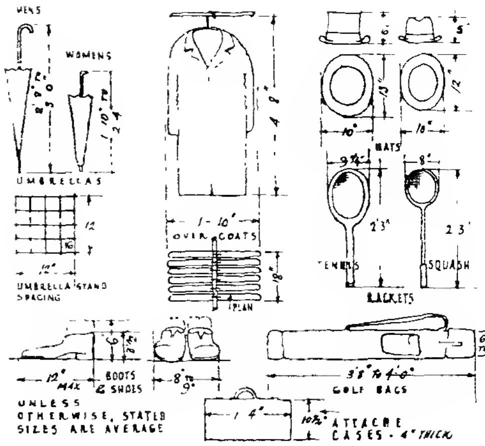



Fig. 29 Dimensions of items for cloakroom storage

### Lavatories

The lavatory should provide, in addition to the basin (the sizes of which vary considerably), a mirror, towel rail (preferably heated) and a shelf for hair brushes, combs and clothes brushes. Care should be taken to place the mirror in such a position that those using it are well illuminated both by night and day. Shelves should be either of some hard, non-absorbent material such as tiles or marble, or covered with glass. Cloakrooms, if they are to be used by women, as is generally not the case on the ground floor, require long mirrors, at least two-thirds the full height of the average person and also space to sit near the mirror with shelves for powder, brushes, etc., within easy reach; or should be planned with space for a table.

The dimensions of sanitary ware and the layout of lavatories are given in Part 1: Sanitation.

### Staircases

*See* Part 1: Circulation.

### Sitting-room

Care should be taken to ensure a correct relationship of the fireplaces, doors and windows. Fireplaces should be so arranged that plenty of space is available for furniture around them, and windows and doors must not be placed in such positions as to cause draughts across the usual sitting places.

Fireplaces are best placed on a long wall, but where central heating is provided, they can be placed at the end of the room.

Windows should provide left-hand light to the most important pieces of furniture, such as writing-desks and pianos. The minimum desirable width for a sitting-room is 11ft.

Artificial lighting of sitting-rooms is generally more satisfactory with wall fittings and local lights (standard and reading lamps) rather than by ceiling fittings, except in very high or large rooms.

One light (usually in a standard or a ceiling fitting) should be controlled from a switch near the principal entrance door of the room for use as a "pilot" light; or alternatively all lights may be controlled by a master switch or switches.

The dimensions of sitting-room furniture are given in Part 1: Furniture.

### Dining-rooms

The minimum size of a dining-room is mainly dependent on the size of the dining table and the number of chairs to be placed around it. *See* Part 1: Furniture.

If the room is to be used for meals only, with occasional other intermittent use, such as for homework, solid fuel fires may not be required, and preference should be given to gas or electricity, possibly supplementing hot air heating or hot-water radiators from the living-room fire; if, however, the room is likely to be in general use as a sitting-room, more continuous types of heating may be required.

### Billiard-rooms

These are large rooms and the floors must carry a considerable load more or less centrally, without any liability to vibration; the most suitable position is on the ground floor. A full-size billiards table measures 12ft. 8in. by 6ft. 8in., and weighs 23cwt., while a common, smaller size of table is 8ft. by 4ft., with a weight of 15cwt. Owing to the length of the cues, a clear space 6ft. wide must surround the tables; if two tables are placed side by side, at least 5ft. should be allowed between them. A billiard-room is little used, except for playing the game for which it is designed, and may therefore be given an unimportant aspect, such as north or east. It is very difficult to provide adequate and suitable daylight for the table, and it is general to side-light the room and play entirely by artificial light. Top light causes bad shadows to be cast by the artificial lighting fixtures.

For other forms of recreation room, *see* Part 1: Recreation.

### Studies

These rooms should be given quiet situations, as they are essentially work-rooms. The most important factor is to provide good left-hand light to the desk. The room need not be large, but should allow ample room for an arm-chair and bookshelves in addition to the desk, which is usually at least 4ft. 6in. by 2ft. 6in. Artificial lighting by means of table lamps, with some background light, is most satisfactory.

### Loggias

An open loggia to which good service may be available either directly from the kitchen or through the dining-room

is very useful in warm weather. It should open towards south or west, and be protected from the east either by a movable partition or by a wall. The floor should be raised above ground level and have a good outward fall, to ensure dryness.

**Kitchens**

The efficiency of the kitchen depends on the layout of the fittings in relation to the sequence of their use. The ideal layout for a kitchen is not generally possible to achieve. Fig. 31 B shows a fairly good arrangement. Good light is wanted for the cooker, sink and preparation table and whenever possible it should be from the front or from the left-hand. The articles to be considered in planning a kitchen and its cupboards are very numerous and varied. Fig. 30 shows common approximate sizes of many of the most usual articles, but sizes of such articles as domestic ranges, whether gas, electric, or coal, refrigerators, etc., vary to such an extent in different makes that it is impossible to give general dimensions.

Storage cupboards vary very much, but the main shelf-height is generally about 3ft. above the floor, with drawers and cupboards placed below it and glazed cupboards above. These fittings are generally more satisfactory and cleaner in use if carried to the full height of the room, the upper parts forming storage cupboards for articles seldom wanted, or for storage of household produce, such as jam. Drawers should not have greater height than 7in. internally, to assist cleaning and prevent untidiness and harbouring of waste. Dresser doors may either slide or be hinged. The former is more expensive and will not permit the whole to be opened at the same time. The latter creates a risk of knocking over objects standing on the main open shelf below the doors.

Ventilated hoods placed over cookers are very desirable for removing the smell of cooking. Cookers should not be placed near larders, nor should refrigerators be near cookers. Gas cookers should be placed out of draughts, so that the flames are not blown out.

Provision may also have to be made for a washing machine but it is preferable if this is allowed for in a separate laundry.

For storage of food, wine and fuel, *see* Part 1: Storage.

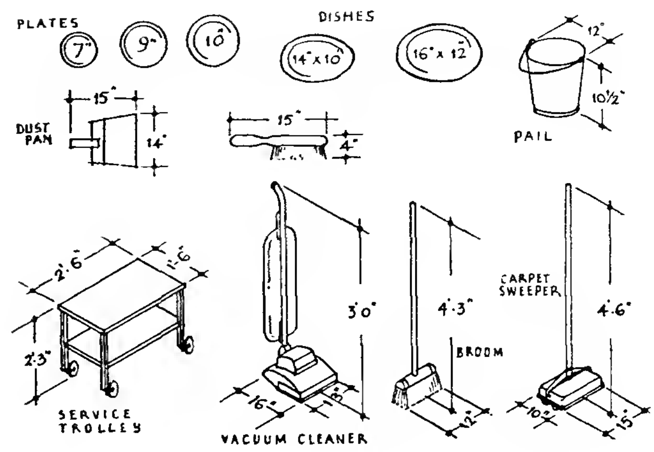



Fig. 30 Dimensions of items for kitchen storage

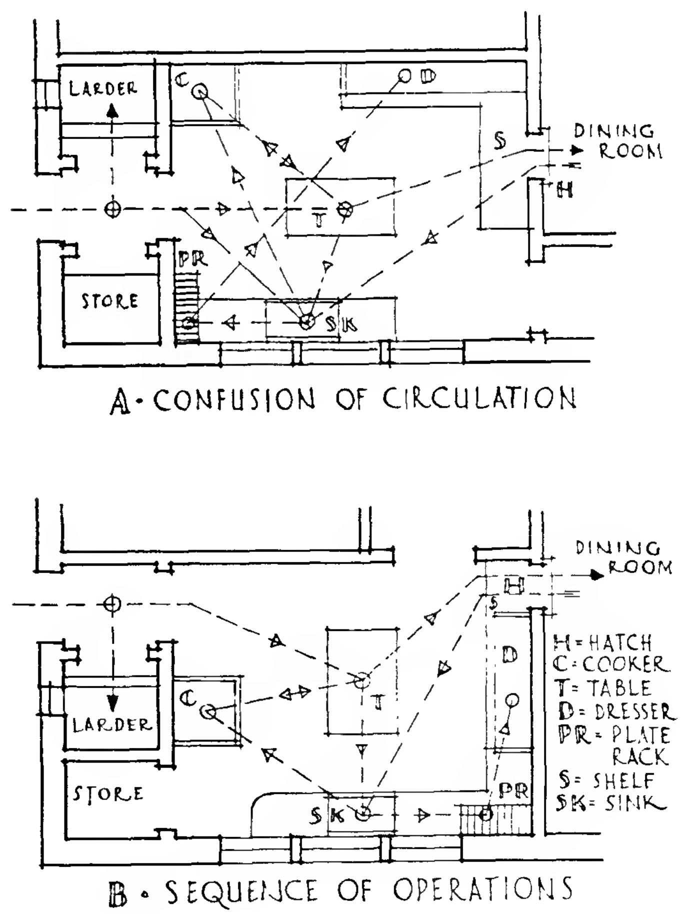



Fig. 31 Comparative kitchen layouts

### Bedrooms

The bedroom, in most instances, has to serve the dual purposes of sleeping and of dressing and consequently sufficient space for both must be provided. In larger houses suites consisting of a dressing-room and a bedroom are frequently provided for the owner and more important guests, but even in that case it usually happens that the dressing-room is used by the husband while the wife still has to dress in the bedroom, or *vice versa*. The shape and size of a bedroom is governed by the space occupied by the essential furniture and equipment, which usually consists of the bed, a dressing-table, a chest of drawers, a cupboard or wardrobe, chairs and a fireplace. The relationship of the bed to the windows, doors, and fireplace is of the utmost importance, to avoid the bed being in a draught and facing the light. The fact of facing the light when in bed seems of minor importance in ordinary circumstances; the objection really arises in cases of illness, when it is very unpleasant to have to sit up in bed with the full glare from the windows directly in the eyes. Fig. 32 illustrates three arrangements of a bedroom. Diagram A shows a good layout, as the draughts between the window, door and fireplace do not cross the bed, nor is it necessary to face the window when in bed. The fireplace allows sufficient space around it for sitting and on each side of it is ample space for a wardrobe cupboard of proper depth and a lavatory basin, which has plenty of elbow-room on each side of it. The position of the fireplace in this room throws the heat across the direction of the draughts and thus warms the room more satisfactorily. The position of the window permits the dressing-table to be placed so as to have left-hand side light and also avoids blocking up the window with the dressing-table, while at the same time the dressing-table is placed so as to have sitting space without interfering with the bed; if dressing-tables are placed directly in front of windows, it is difficult to open the windows or to draw the curtains and the external appearance is unsightly.

There is space at the sides of the bed, since it is placed against a clear wall, for bedside tables and/or chairs. In Diagram B the bed faces the light and does not allow comfortable room for the dressing-table, nor is there room for a chair by the bed.

Diagram C illustrates a room which is really badly arranged; the bed is in a draught between the window and door and there is not enough space to place a chair or table by the bed; the dressing-table has to be given right-hand light and the cupboard is insufficiently deep for clothes storage; owing to the liability of splashing, the placing of the basin near the bed is bad. The general principles illustrated by the figure apply to the design of all bedrooms. It should be noticed that the three diagrams in the figure have the same area and also have the same amount of furniture; they are designed for a single bed, but in Diagram A it would be possible to use a double bed without cramping the room.

Beds should not have to be placed with a long side against a wall except in very small and unimportant rooms, owing to the necessity of having to move them daily when the bed is made and owing to the difficulty of cleaning under them.

Doors should not be placed on the same wall as bed-heads except in very small rooms, but when this is necessary a space of at least 1ft. 6in. must be allowed for a bedside table or chair.

The ideal aspect for bedrooms is south-east, so as to be bright early in the morning, during the daylight hours in which they are used.

### Furniture

The dimensions of bedroom furniture are given in Part 1: Furniture.

### Fittings

A wardrobe cupboard to accommodate ladies' hats or clothes hung on hangers at right angles to the door requires at least 22in. in the clear or, if clothes are hung parallel to the door, widths should be in units of 24in. For a man's wardrobe the height required for hanging is 4ft. 6in. and for women's about 5ft. 6in. Cupboards for the storage of clothes are better if partially lined with cedarwood as a protection against moths.

Windows in bedrooms are generally satisfactory with the glass line 3ft. 6in. above the floor level, and they should extend to an opening height of at least 7ft. above the floor, if possible, although some by-laws permit this height to be reduced to 6ft. 6in. if rooms are in the roof.

### Bedroom Suites

Fig. 33 illustrates a typical suite consisting of a double bedroom, a bathroom, including a W.C., and a dressing-room.

### Bathrooms

*See* Part 1: Sanitation.

### Nursery

Nurseries are usually placed on upper floors, but should not be directly over reception-rooms, owing to the noise frequently produced by the children. Easy access from the kitchen is essential. The ideal aspect for a night nursery is south-east, and never westerly, as the sun is still bright in the summer months after the average bedtime of children. A day nursery may have any aspect from south to west, although it is argued that aspect does not matter, as children are mostly out of doors in fine weather, and only indoors when there is no sun. In larger establishments the day and night nurseries are usually formed into a suite together with the nurses' bedroom, a bathroom and pantry; but in small houses where nurses are not employed the day nursery is better placed on the ground floor, for the convenience of the mother and in that position saves the transport of meals to upper floors.

### Day Nursery

This should be as large a room as possible, and should have large windows with a specially low glass line, so that the children may see out of them. The windows should be protected to the full height against the possibility of children falling out. Ample cupboard space is needed for toys, nursery china, books, etc.

### Balcony

A balcony for daytime rest is a very useful asset in connection with the day nursery. It needs to be at least 6ft. wide and have suitable guard rails of an unclimbable type.

### Night Nursery

It is general to plan the night nursery with direct communication to the day nursery, so that children do not have to run about the corridors of the house. Cots are usually 2ft. 3in. wide and 4ft. 6in. long. Cupboards for clothes are needed, but it should be remembered that the clothes are much smaller.

It is unwise to place lavatory basins in night nurseries, especially when children are older, as they offer too great a temptation for amusement.

In planning nurseries it should be remembered that the period of this special use is limited and that the rooms may be required for ordinary bedrooms when the children grow older.

### Nursery Bathroom and Pantry

The cost of providing a special children's bath is probably unnecessary. The basin, however, is better if set at a slightly lower level, to be within comfortable reach of children aged about eight to ten years. The W.C. may be placed in the bathroom and is better if it is of a special low type. The pantry needs a sink with draining boards for washing and washing-up, some method of heating for minor cooking, such as heating milk for bottles, space for a small wringing machine and cupboards. A separate linen cupboard for the use of the nursery group is desirable, and should be very well heated.

Fig. 34 illustrates a nursery suite for a large house.

### Sleeping Porches

Open-air sleeping porches are frequently desired by clients, but, when provided, they should be carefully designed to combat the rapid changes of the English climate. It is essential that they should be roofed.

Movable screens are desirable as protection against wind and rain and these may be one of several types, such as windows falling into or inside the balustrade, folding screens or windows as shown in Fig. 35, or loose screens fitted between the balustrade and the top of the opening.

The minimum width should be at least 8ft., and better rather more, to allow circulation round the beds. Doors from the bedroom should be at least 4ft. wide and therefore of the double type. It is better if the balustrades are made solid, so as to reduce the view of the inside of the porch from the ground level.

Fig. 35 illustrates the layout of a minimum-size sleeping porch for two single beds.

### Maids' Bedrooms

These are usually grouped together in a wing or on a floor above the main bedrooms and should have easy access

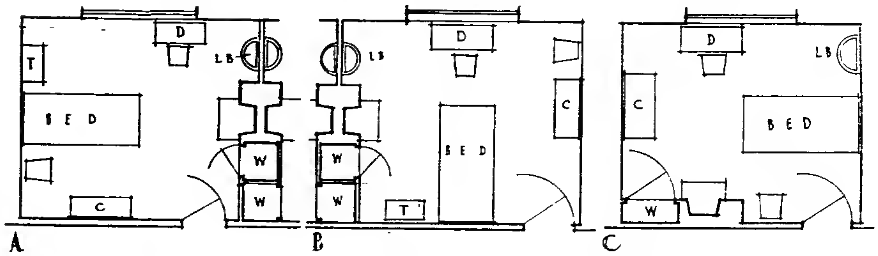



Fig. 32 The bedroom: good and bad points in layout of essential elements

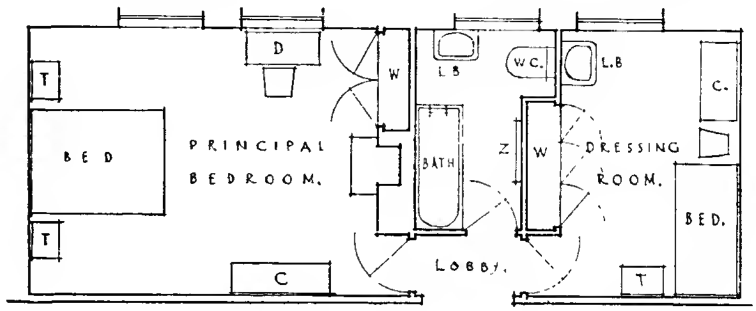



Fig. 33 The bedroom. A typical suite containing bath- and dressing-room

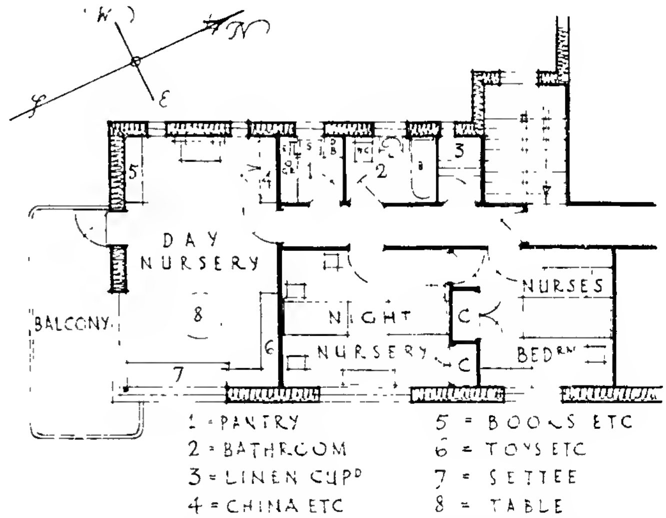



Fig. 34 The nursery suite: a separate wing arranged for children

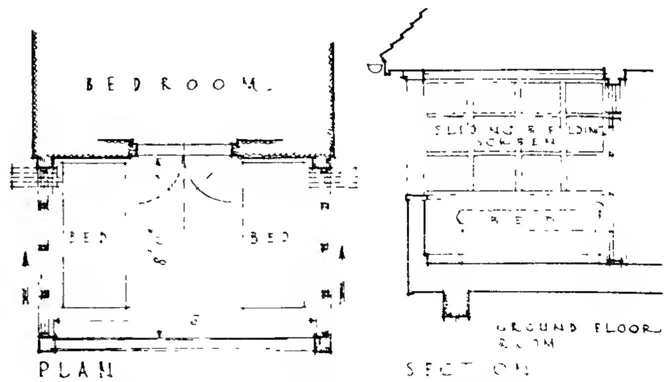



Fig. 35 The sleeping porch: a typical plan on the end of the bedroom wing

from the kitchen wing, preferably without entering the main bedroom corridor. Each maid's room should have a minimum area of from 70sq. ft. to 75sq. ft., unless bed-sitting rooms are provided, when the area should not be less than 100sq. ft. A separate room for each maid is the most satisfactory type of accommodation, but if two maids have to be placed in one room, it should be a long rectangle, capable of division by a curtain. Each maid should be provided with a built-in hanging cupboard, not less than 1ft. 10in. deep and 3ft. 6in. wide, the full height of the room, with a cupboard over the main hanging cupboard for hats, etc. Lavatory basins in each room save a considerable amount of labour, but are unnecessary if a separate bathroom with a lavatory basin is provided for the use of the maids only.

### Housemaid's Closet

A housemaid's closet is necessary on each bedroom floor, and should have sufficient space for a slop-sink, draw-off tap with a tray for filling pails, etc., with a cupboard for the storage of brooms, dusters, and cleaning apparatus.

### Linen Cupboard

*See* Part 1: Storage, for information on the storage of linen.

### Domestic Services

The services required in a house are tending to become more numerous and complicated year by year, but the extent of their use in each job is largely a matter of cost. Very few of these engineering services affect the actual plan of a building to any large extent except in matters such as size and number of boilers, fuels to be used and stored, flues to be provided, etc.; except in the case of country houses where machine rooms have to be provided for the making of gas or electricity, and the pumping of water, etc. The areas required for these services depend so much on the size of the house that no useful guide can be given.

In districts where all services normally available are provided by supply companies, it should be borne in mind that trenches, ducts and chases may be used for several purposes except that in no case must gas and electricity be together.

### Heating, Hot Water, etc.

Since houses vary so much in size, comparative systems cannot usefully be discussed here. The points to be watched, however, are: the number and type of boilers required, such as separate boilers for hot water and heating or an indirect system from one boiler; where they are to be placed, as, for example, in the hall, kitchen, or separately; whether the stoking is to be done by indoor or outdoor staff and what fuel is to be used. Fuel storage, however, must be close to the boiler room. In the case of oil, the tank should be placed in relation to outside delivery and then pumped or fed by gravity to the burner. There are many aids to reduction in fuel costs and to comfort which should be remembered, such as automatic dampers and time-control switches which raise the boiler temperature at fixed times and maintain it as required. Radiators should be placed close to the greatest cooling surfaces affecting each room, usually the windows.

In many country districts none of the usual services, such as lighting, water and drainage, are available and must be provided by the owner. Various systems of lighting are available, but the most usual is electricity provided by means of a petrol or oil engine. An ordinary small plant providing up to 5 kilowatts requires an engine room about 15ft. by 10ft. and a battery room about 10ft. by 6ft.; but a plant such as this does not leave a large margin for power loads. Water may be lifted from the well to the storage tank by an electric pump, automatically controlled by high- and low-level switches, or by means of a pump operated directly from the lighting engine.

### Drainage

For isolated houses this may be either by means of cesspools, or, better, by septic tanks as the latter do not require much attention, and the effluent is more easily disposed of by irrigation.

### Other Services

To be considered in planning are refrigeration, telephones both external and internal, radio and cinema projectors. Refrigerators are usually purchased as complete units, using either gas, electricity, or oil, as ordinary domestic requirements are too small to justify the installation of a refrigerating plant. House or internal telephones are being substituted for bell systems in many houses to avoid the necessity of a maid answering a bell to find out callers' needs. Radio now needs consideration, both with regard to wiring from the set to each room and the necessity for providing plug connections to operate the set. Cinema projection, although at present in its infancy in private houses, is undoubtedly growing in popularity with the employment of the miniature film. Special projection boxes are not needed, as the films are non-inflammable, but some sort of box or fitting in which the necessary plant may be placed without using pieces of furniture, which may be liable to the possibility of damage by heat, is an advantage. Such a fitting should provide room for operating the instrument and for the storage of film reels. A throw of 15ft. to 18ft. is needed on to a wall from a suitable position having electricity supply.

### Garages

*See* Part 1: Transport, for information on the planning of garages.

## Introduction

Allotments are small areas of land, generally within urban localities, which are used for growing vegetables, flowers, and to a small extent, fruit; they are generally leased by those who have insufficient garden space attached to their own homes. Allotments seem first to have arisen as the result of the Inclosure Acts of 1891 and 1831; these Acts were followed by others and were eventually consolidated in the Small Holdings and Allotments Act of 1908. Local Authorities can acquire land for the purpose of allotments, and are empowered to lease it in small plots to those requiring them. There are now about 125,000 acres occupied in Great Britain as allotments; the problems of placing, of planning and of ensuring the pleasant appearance of these areas are, therefore, worthy of considerable thought. Up to the present time, in this country, the subject has received little attention.

## The Need

A need for allotments is naturally greatest in closely built-up neighbourhoods or in those areas where house-sites are very small. The demand is unlikely to be so great in housing areas where modern planning and layout provide adequate gardens for all densities up to 12 to 15 houses per acre. Where the density is greater than 12 houses per acre, or consists largely of flatted dwellings, it has been found, in the past, that a provision of one allotment for every 10 dwellings will suffice for most districts outside the centres of the largest towns. It should be borne in mind, however, that, with the reduction of working hours and of the length of the working week, a greater desire may emerge for gardening, with a consequent increased demand for allotments.

Even where relatively large house-gardens are the rule, there may still be some demand from enthusiastic gardeners for additional accommodation in the form of allotments.

## General Layout

Allotments are often very unsightly and untidy areas which, under some circumstances, may even be doubtful amenities. Much may be done to overcome, by proper design, any objections to the provision of allotments within new housing areas. If all the buildings, fences, planting, and all other parts of an allotment area are planned and controlled from the start and the allotments related to the layout of the houses and public open spaces of a scheme, many of the difficulties and most of the objections will be eliminated.

A good, simple, and, above all, orderly layout with provision for hedge screening, service roadways, proper entrances and grouping of buildings, having especial regard for the appearance of the whole from public highways, can improve rather than detract from both the facilities and the pleasures of allotments.

Screening, by trees or high hedges, should be used carefully in order to avoid unnecessary shading of plots and the deterioration of the soil of the plots by the spreading roots of any such heavy planting.

Simple benches or seats, in sunny and sheltered positions, may usefully be incorporated in the general layout. It has been suggested also that, in a large scheme, the provision of a small enclosed play-area for children of tenants may be provided and would be appreciated in some areas.

It is important that allotment sites be adequately fenced or enclosed by hedges to prevent access by animals, especially in rural districts where sheep or cattle might stray and cause much damage in a short time.

The individual plots of an allotment area should be clearly and permanently marked for identification purposes by the Local Authorities and others.

## Siting

Almost any vacant piece of ground within a development scheme may be used for the purpose of allotments; internal or "back-land" plots are often best used for this purpose. The land must, however, have reasonably good and clean top-soil and good natural drainage, or be so situated that adequate drainage can be arranged.

The total area of a group of allotments on any one site may be quite small, though anything under about an acre is probably impractical from an administrative point of view. Within reason, the sites may be of any shape. Situations unsuitable for other uses, such as "insulation" or barrier strips alongside and adjoining railways and trunk-roads, may well be used for allotments. It is desirable, however, that all land so used should be reasonably close to the tenants' homes. Where conditions of development will not permit this proximity, a distance of one or two miles is possible, especially if good public transport is available; long journeys, however, will reduce the available working time on the allotments and make them less acceptable for many tenants.

Where there is a choice of sites, those having a southerly aspect and a fall in the same direction are to be preferred; as also are those protected on the north and east from cold winds.

Allotments can sometimes be provided in a large number of small sites with perhaps six to ten plots each; or alternatively large areas of land can be laid out with allotments and full communal amenities grouped together. There are advantages for both types of site.

In the first type, proximity to the home is nearly always possible, and in the second type the provision of fuller communal facilities, in charge usually of the local Parks Department, with demonstration plots, communal green-houses and cold frames and central bulk storage, is possible; a large size for the undertaking brings those provisions into the range of the economically and practically possible. (*See* Fig. 40 on page 107.)

## The Plots

Allotments are usually about 10 rods (approximately 300sq. ft.). This area generally takes the rectangular form of 90ft. by 30ft. (net sizes). Access paths to all the plots and service roads have to be added to these net sizes. In some schemes provision is made for letting half and even quarter plots of 5 rods and 2½ rods respectively.

It is desirable that the length of a rectangular 10 rod plot be approximately three times its width, as this allows for planting-rows of a reasonable length (across the plot) and for working a three-year rotation of crops. It is advantageous if the length of the plot runs from east to west, so that the rows of plants are approximately north and south. (*See* Fig. 36 on page 107)

### Access: Entrances, Roads and Paths

The main service roadways should be planned so that there is not more than one plot between any other plot and the nearest service road. This is to reduce as much as possible the distance through which bulk deliveries, such as manure, have to be moved in barrows, etc., by tenants. These main roadways should be at least 12ft. wide and have a hard base suitable for carts or motor lorries. It is important, if motor vehicles are to be used, that turning spaces are sufficiently large; much more space is needed than for horse-drawn vehicles.

Access paths to and from and between plots should be at least 3ft. wide and probably rather more, as less than this width is inconvenient for wheelbarrows, which are as much as 24in. wide, across the top, and have an overall length up to 4ft. 6in. These paths may be, and usually are, grassed.

Main service roads are often bordered with flower-beds or with shrubs, and sometimes with trees to assist the general appearance of the scheme. If such methods are adopted, the plots adjoining the roads are often increased in size by strips of 4ft., 6ft. or even 10ft. widths. Very narrow borders are useless, especially if trees or high shrubs are to be grown; spreading tree and shrub roots may completely spoil a considerable part of the adjoining allotment space. In some schemes fruit trees have been planted adjoining roadways; these are maintained by the tenants of adjoining plots, and they enjoy the benefit of the produce. Large forest trees close to allotments are undesirable, even when they serve as windbreaks or screens, because of the large areas of ground shaded by the leaves or needed for the roots.

Large double gates for vehicular traffic (at least 10ft. in total width) are needed at entrances. Pedestrians' side gates, at least 2ft. 9in. wide, should be provided for normal day-to-day use; these gates should be self-closing. (*See also* Figs. 36–40.)

### Water Supply

Water should be available for all allotment schemes and supplies should be arranged at reasonable distances from each plot. The need can often be met by stand-pipes and water butts or tanks at communal tool-sheds, or alternatively by installing a stand-pipe and tank to be shared by every four or six plots. It is essential for the water supply to be controlled from some central point and that the whole system is able to be drained in winter. Taps should be ½in. and the pipe sizes such as will ensure a rapid flow. (*See* Figs. 38 and 39.)

Hoses are not usually permitted on allotment sites; special high pressures are not therefore necessary.

### Buildings

Provision must be made on all allotment sites for the storage of tenants' implements, etc. All individual sheds or communal buildings for this purpose should be properly designed and grouped; many schemes are now very unsightly due mainly to the incongruous collections of huts of all shapes, sizes and materials. There are two main methods of meeting this need for storage. Firstly, by means of individual lock-up sheds, each about 5ft. by 5ft., separately sited or in groups of four. Secondly, by a large communal building to serve all or large groups of tenants on each site.

The first scheme is the most desirable from most points of view, but is costly and probably occupies more land; it provides, however, more privacy and each tenant can store more tools, some larger equipment such as a wheelbarrow, and also have somewhere temporarily to store produce, plants, etc., during the winter; individual sheds also provide localized shelter during sudden inclement weather or in which to rest.

Communal facilities may take merely the form of large buildings used by several or a large number of tenants but this implies lockers or the equivalent for each tenant. A recent development is to divide part of such a building into a series of cubicles each allotted to an individual tenant, in the smallest cases for not more than eight or ten occupants. A further development provides a single central communal building with a locker or cubicle for each tenant of the scheme.

The lockers or cubicles we have described should be the full height of the building and at least 1ft. 6in. by 2ft. on plan. This accommodation will not, of course, provide storage for any large quantity of material such as fertilizers or of larger equipment such as a barrow. The cubicles should be closed with some sort of door, for example, of wire-mesh, which can be locked.

Sheds or cubicle buildings of whatever type must be dry and have concrete or similar substantial floors, especially if they are to be used for bulk storage of materials, lime or fertilizers. The larger types of communal buildings should also have solid floors on which boards or timber slats can be laid, particularly in the storage parts of the building.

Arrangements for hanging up tools are needed in all types of cubicle or locker, together with some shelves for seeds, string and netting materials, etc.

Cubicles and lockers and sheds should be ventilated to the open air; the sheds can be provided with an opening shutter, fastened from the inside of the shed.

Glass windows are not to be recommended for these scattered sheds if the allotments are at all isolated from surrounding buildings or away from adjoining highways from which police supervision is available.

The following are some typical sizes of objects for which storage is required: Rakes and hoes, 5ft. 9in. long by 15in. wide; spades and forks, 3ft. 4in. long by 9in. wide; stakes, bean-sticks, etc., may be up to 8ft. long.

### Communal Buildings for Larger Schemes

In a scheme of sufficient size it may be necessary, in addition to the tenants' part of the building, to provide for bulk storage of supplies and for large implements or tools which are sometimes hirable: a small office can be included for the secretary of the Allotment Society or the officer of the Parks Department who may be in charge of bulk purchases and the issue or sale of supplies (seeds, cuttings, fertilizers, etc.). This sort of accommodation may be under the same roof as that of the tenants or it could be planned as a separate building.

Occasionally it may be considered desirable to provide a communal rest-room, which could also be used for meetings, discussions, demonstrations, etc. This room could well have a kitchenette attached, so that light refreshments could be prepared. (*See* Fig. 40.)

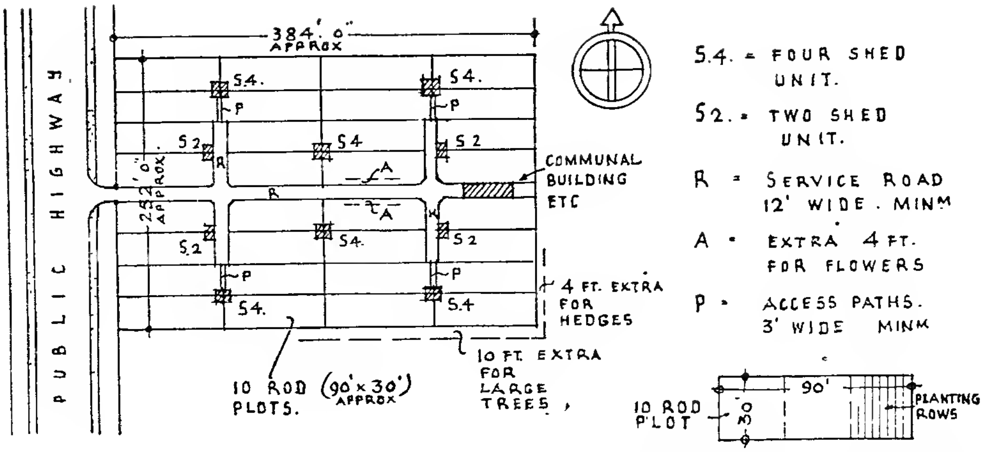



Fig. 36 Typical layout on a small (2½ acre) site

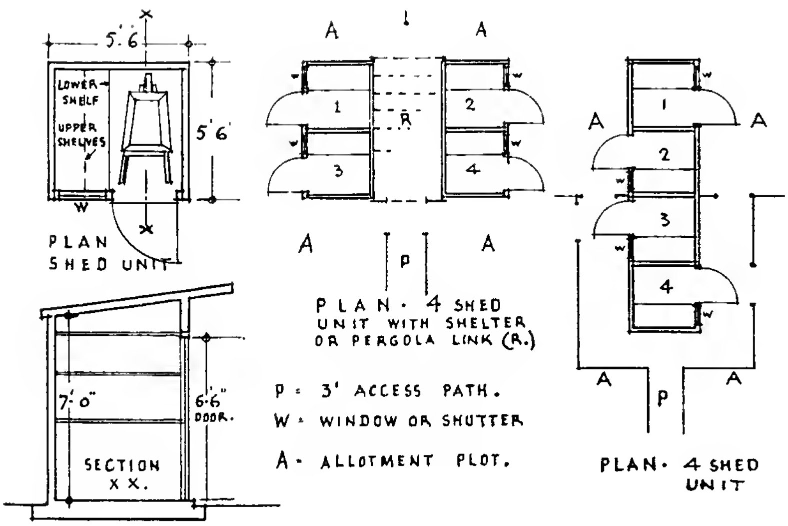



Fig. 37 Grouping of tool sheds

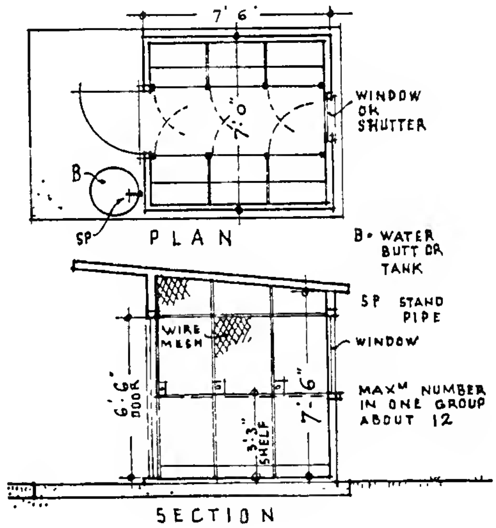



Fig. 38 A typical cubical shed

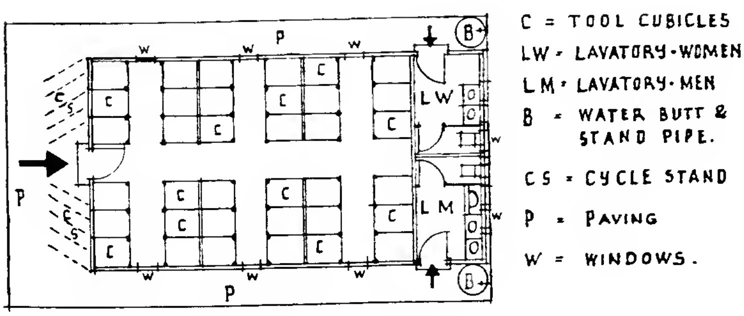



Fig. 39. A typical large communal building

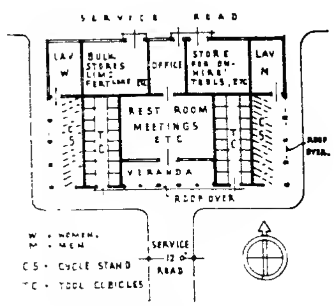



Fig. 40 Central building on a large site

### Sanitary Accommodation

Some lavatory facilities should be provided for both sexes on all larger sites. In the spring and summer tenants spend longer periods, even the whole day, with picnic meals, on their allotments. Sanitary accommodation must obviously be planned where water and drainage services can best be arranged. Where a central communal building forms part of a scheme the W.C.s, urinals and lavatory basins, however, should be included within such a building.

### Greenhouses and Cold Frames

In some schemes the installation of cold frames is allowed on any allotment at the tenant's own discretion and risk. Other authorities set aside a space for frames, and the latter can be locked and rented separately.

Demands for greenhouses vary, but if they are incorporated in any scheme, the type and size should be uniform and of satisfactory appearance. Small unheated greenhouses are wanted by a small number of tenants; the " glass " should be grouped in a block or blocks and planned as a part of the whole layout and in proper relation to the other buildings. If the greenhouses are scattered to form groups with the tenants' tool-sheds it may be possible to allocate those plots bearing " glass " to those tenants requiring this amenity, but it is obviously a difficult matter to prearrange; a certain flexibility, therefore, in the layout is always desirable. It is possible, in the future, that arrangements will be made for the hire of sectional greenhouses, so that these may be rented by a tenant and erected on any given allotment.

Greenhouses should be as far from public highways as possible.

Heated greenhouses are less popular on allotments as they are usually too far from tenants' homes to receive, without great inconvenience, the continual attention necessary. Proposals have been made, however, and there may be existing instances of, heated greenhouses which are controlled and heated from a boiler room in the central communal building.

Use of such greenhouses is more likely to be required in connection with the even more centralized provision and distribution of supplies of plants to both allotment holders and householders by the parks department of a local authority.

### Introduction

The flat is primarily a type of dwelling for urban development, for crowded areas and expensive sites. The tendency for it to increase in popularity is due to various causes, the most important of which is the desire to live in towns and, therefore, close to centres of work and business, with corresponding avoidance of loss of time in travelling from suburban houses. Another and important cause, especially applicable in less densely populated areas, is the reduction of domestic responsibilities and labour which flats provide, especially when it is remembered that rents are often inclusive of rates, taxes, upkeep of staircases and gardens, heating and hot water. Accommodation is generally smaller than that provided in houses for a similar class of tenant, but equipment and finishing are generally of a higher standard and better quality as a compensation. A criticism frequently levelled against flats is a possible lack of privacy, but it is doubtful if this lack is greater than in ordinary town houses, planned in terraces or than in rows of suburban dwellings, for each flat can be self-contained and approached from a staircase and lift hall, which are, in fact, a vertical extension of the street. Two of the essentials of good flat design and construction are efficient insulation between the flats against the passage of noise and an adequate lift installation, if the flats are above three or, at the most, four stories.

### Sites

The selection of a site for a block of flats in the heart of the city is more dependent on its shape and size for a satisfactory development than on its situation.

Practically any site is possible if the ground value is not prohibitive as it would be in districts suitable for offices (for example, in the City of London), but excessively noisy sites should be avoided if possible. The relation of ground value to rentals and to the type of accommodation to be provided, are two of the main deciding factors in site selection.

Rentals of flats are not directly relative to accommodation, but rather to the situation of the site, which may be illustrated by the fact that a two-roomed flat in St. James's, London, may be equal in rental value to a seven- or eight-roomed flat in Hampstead. The suitability of the perimeter, shape and size of the site may be more adaptable to one type rather than another; as, for instance, a particular site might be more economically developed with three small high-rental flats than, say, two larger flats, since the latter might be slightly crowded and thus not command the full rental for their type.

Surrounding property also requires very careful consideration, especially in regard to rights of light; and the fact of having other flats near is an advantage rather than a competitive disadvantage, unless the district is already over-built. Actual site conditions, such as those which govern excavation, drainage and foundations, should be weighed up with particular care, as excessive costs below ground are a great tax on total construction costs. The locality of the site in districts outside the heart of a city needs thought from other points of view, and more particularly in regard to access, transportation to business centres, to shops and to amusement centres; in outlying districts freedom from traffic noise is essential, but nearness to road and rail facilities is a great factor and it may well be said that the nearer the building is to a station the more likely it is to let quickly. Flats in country districts do not let easily, as the rentals are of necessity often greatly in excess of those of separate houses providing similar accommodation. In partially undeveloped areas the trend of the neighbouring developments must be considered very carefully and only sites in improving districts should be entertained for flat schemes, as such schemes can only be looked upon as investment projects.

Attention should be paid to any possibility of using the ground floors to accommodate shops, a factor which also has the advantage of providing a development for a part of the basement (as shop stores) which is generally of little value except as lock-up (and often unused) flat storage. If the trades for which the shops are used are controlled no disadvantage is incurred by placing shops below flats. The relative merits of leasehold and freehold property are beyond the scope of this book, although they influence site selection very greatly.

### Types of Flats

There are very many types of flats, ranging from one-room and bed-sitting-room types at low rentals to luxurious apartments with seven or eight bedrooms and three reception-rooms. The variations are enormous, both in accommodation and in rental, but it must be remembered that a medium-rental and a high-rental flat often have similar accommodation as regards number of rooms, but are completely different in equipment and in finish.

The various differences are dealt with in the consideration of the room requirements, but generally it is unwise to mix too many types of flats or to have great variation in rental values within the same scheme.

### Daylighting Code

Planning authorities are now using the daylighting tests for the design and layout of buildings set out in "Redevelopment of Central Areas", 1947 (H.M.S.O.). This handbook relates the methods and tests to non-residential zones, but many authorities with administration over high-density areas are using an application of the code for residential zones. The code sets out to ensure that enough daylight reaches the ower walls of buildings to enable rooms to be lit with normal-sized fenestration. The latter is, of course, different for dwellings and for other buildings and special "indicators" or protractor devices are used which allow for these differences: those given, therefore, in the above-mentioned handbook will not apply for residential planning: the latter are given in Appendix 3 of "Density of Residential Areas", 1952 (H.M.S.O.). Two sets of "indicators" are used, one for the design of buildings affecting each other on the same site and one for determining the effect of buildings external to the site.

The latter are used from the centres of streets or from the lines of site boundaries where there are no streets. Certain anomalies arise in the use of these code indicators and they must be used with due regard to other factors, such as the effect of aspect and sun angles. Designers are advised to ascertain the requirements of local authorities in these matters, as methods usually vary in different localities.

## ASPECT

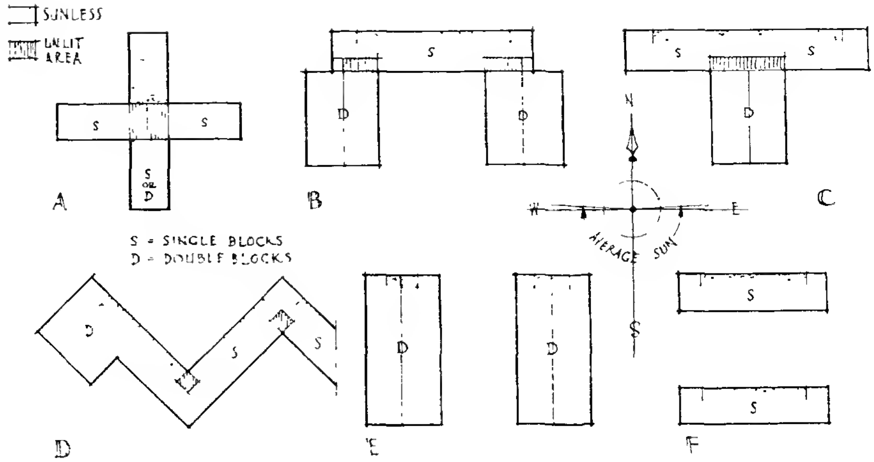
### Aspects

The aspect of a site for flats is not of very great importance, although the position of the roads for main and secondary access will always have a certain amount of influence. As regards the actual blocks themselves, aspect is an important factor when deciding on the plan shapes to be used.

Fig. 1 illustrates six typical plans of block shapes commonly used for flat developments. Type A is bad, as the northern wing has no direct sunlight and, in addition, a large part of the floor area is impossible to light from windows in the external walls. Type B is an economical shape, as only a small portion is without sunshine at some time during the day; the two wings projecting southwards may be of double flat width and the open space between may be fairly narrow, yet still allow sufficient penetration of the sun to all windows.

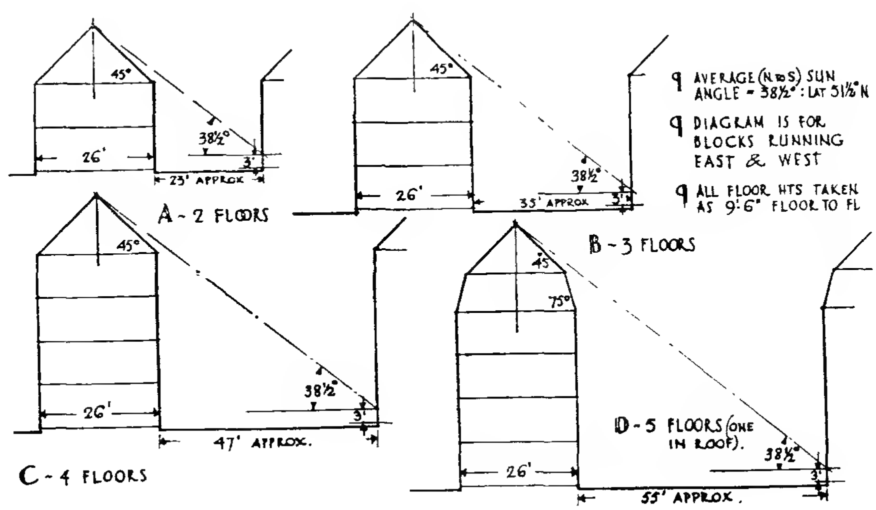
Type C has similar merits but, in addition, often works out in practice to be more economical as to the number of staircases required for development. Type D is uneconomical in land on the majority of sites and has a great deal of external walling. Type E generally proves to be one of the most economical plan shapes in regard to the amount of land required, but has the limitation that kitchens and larders have to be given sunny aspects unless internal areas are used. Type F requires much more ground area as the blocks must be placed farther apart to allow the sun to reach the lower windows of the back block. This may be clearly seen from Fig. 2, which shows the spacing necessary for blocks of various heights when they are running east and west. The distance apart of blocks will increase as the blocks deviate from a true north-south aspect, up to a point midway towards the true east-west aspect. The amount of sunless wall in Type E is very small and neither in this nor in Type F are there any spaces which are particularly difficult to light.

While it may be desirable to plan blocks with such spacing as will provide one hour of sunlight per day into all main windows, it will be found that to attain this ideal at mid-winter requires the 38½° shown in Fig. 2 (the annual average) to be reduced to 15°: it is doubtful if this could be justified on costly urban sites.




Above: Fig. 1 The shapes of blocks in relation to aspect

Below: Fig. 2 The heights and spacing of blocks in relation to sunlight



### Built-up Frontages.

It is sometimes necessary to build up to the building line of a site, especially in towns where site values are high and in suburban districts where the street frontage is valuable for shop developments. One of the great disadvantages of a street frontage development is traffic noise, which is very difficult to overcome, but trouble is considerably reduced if the site has an open space or low buildings on the opposite side of the street. Bedrooms should not be placed overlooking busy streets even if the result is bad aspect.

### Access to Flats Over Shops

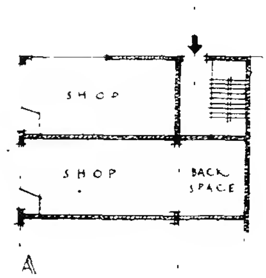
Access to flats placed over shops usually presents a difficult problem, as owners do not like wasting, on the flat entrances, frontage which would otherwise be available for shops producing high rentals. Generally speaking, however, the main entrance should be from the main street, since, if it is from a secondary street, the rentals are reduced as the address must be that of the secondary street, and the main entrance may also be difficult to find. In the case of flats let for low rentals or to be used for the purpose of housing the tenants of the shops, it is of less importance to enter from the main street (*see* Fig. 3 A). If an entrance is required between the shops a passage of at least 5ft. width is needed, and the staircase, which needs at least 7ft. 6in., can then be placed well back from the frontage, avoiding the use of more valuable rental space, as illustrated in Fig. 3 B. When flats are of the medium- or high-rental class considerably more space must be allowed for the entrance as it is essential to have it sufficiently large to permit of good planning and decoration without any feeling of meanness, since first impressions gained by prospective tenants and visitors are of the utmost value. Secondary access for service uses may with advantage be placed in a secondary street and should not be visible from the main entrance; by the use of secondary streets tradesmen's vehicles are not likely to block up the approach to the main entrance.

### Lettable Ground-Floor Space

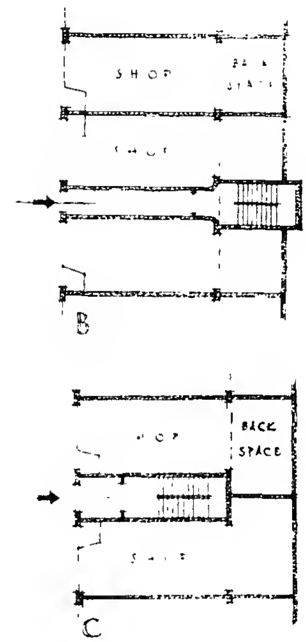
Shops or business premises may be placed under all classes of flats so long as the street justifies shops of a quality approximately equal to that of the flats. The shops are usually suitable for only one or at the most two frontages of any block and frequently very difficult planning is involved to provide suitable areas and access to shops on two frontages, and to flats on back parts of the site. In most central urban districts it is an advantage to have basement space under the shops, most of which is used for storage purposes, as in such districts storage and backyard space is not available. In suburban districts, however, basements are seldom provided.

It is impossible to give more than a rough guide as to sizes for shops, especially as to the necessary frontage widths to be allowed. Shops very frequently have small frontages of 12ft. to 15ft. in expensive streets, whereas in the better streets of suburban areas larger widths up to 25ft. are often needed. In the secondary shopping streets frontages are again of the smaller sizes, averaging 15ft. Shops should generally be of greater depth, usually between 35ft. and 50ft., than the flats above, which generally do not have a span exceeding 28ft. to 30ft. (*see* Fig. 4). This difference in depth permits the top lighting of the back part of the shops by lights.

A good general width may be taken as 16ft. to 18ft. If shops are made of greater width there is a tendency to subdivide them into two, which is not favoured by landlords, nor is it wise from the æsthetic point of view. It will be found that the spacing of the shops has very considerable bearing on the design of the flats over them, as if they are narrow it is difficult to place a flat or maisonette over each shop even on the two floors and, equally, if they are moderately wide the flats are uneconomically large. If a corner site is developed, the shop having the return frontage has greater value owing to the increased display space, but unless both roads are of real shopping value it is useless to continue the shop-front along the secondary street for more than the depth of the shops fronting the main street.

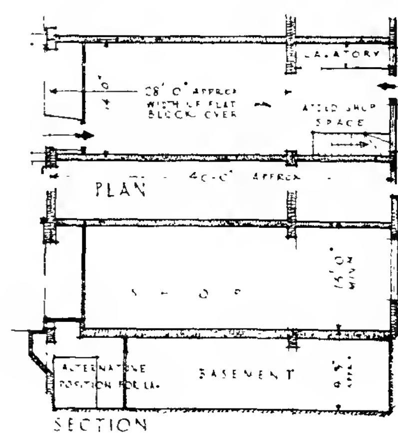



Entrance on a secondary street




Entrances between shops

Fig. 3 Entrances to flats over shops




Right: Fig. 4 Typical spacing of shops for flat development above

## FLATS ON VARIOUS FLOORS, APPROACHES, FORECOURTS, CAR-PARKING, COURTYARDS

### Flats on Various Floors

Ground-floor flats are generally unpopular and therefore do not produce such high rentals as other floors. Except where there is an area which is difficult to cross, the risk of burglary, and also the fear of passers-by looking into the windows, frighten many tenants. Basement flats are now subject to strict regulations, may be prohibited under somc town-planning schemes, and should not be included in any new flat projects. Top-floor flats are usually the most popular so long as there is really efficient lift service. Top floors are lighter, less noisy, obtain more sunlight and cleaner and fresher air.

For flats for working-class occupation or of a very low-rental type, the five-floor plan is probably the most economical, but in the medium class economic rentals cannot be obtained for flats without lifts if more than three stories high and it is generally found that the choice of scheme is between the three-story building without lifts and one carried to the maximum permitted height with lifts, so as to spread the cost of the latter together with the necessary attendants over the maximum number of flats. The building heights are governed by the restrictions laid down in the by-laws as to maximum heights and also by economics of construction and fire-escape requirements; the latter affect very much the planning of flats, as alternative means of escape are necessary in buildings of more than three stories, certain exceptions being made when balcony approaches are employed with independent staircases, all of fire-resisting materials.

### Portions of Sites Not Built Over

In the development of large sites it will usually be found that only about 50 per cent of the total site area is covered by the aetual building, leaving the remainder as areas, courtyards and gardens. These unbuilt-upon spaces will have to be differently treated according to the type or class of flat. In the case of tenement or working-class dwellings the whole of the site should be closed to traffic and used as play areas for the tenants and their children. Where moderate rentals are charged, a certain amount of layout and gardening is nccessary, but again traffic approaches are not particularly required. The more expensive and luxury types, however, need traffic approaches to the main entrances as well as to service entrances; cars should be able to set down passengers under cover at the main entrance doors, but driveways into buildings for this purpose on crowded town sites are usually expensive and wasteful, without sufficient justification to warrant adoption.

### Main Approaches

Main entrances to all better-class types should be easily visible when approaching a block of flats; when sites are not too small or are of such shape as to permit it, entrances to all flats in a block should be through the same doorway (or past the same porter's lodge on large schemes), so as to avoid the cost of duplicating attendants.

### Secondary Approaches

The lower-rental types do not, as a rule, have secondary approaches or secondary access to the flats, but for all other classes secondary service entrances are essential for tradesmen's deliveries, which must have proper road approaches. It should not be possible to confuse these approaches with main approaches; the two must therefore be separated as much as possible; side or back roads where available should be used as shown on the left-hand side of Fig. 5, or, if they are not available adjoining the site they should be formed on the site itself, as shown on the right-hand side of the same figure. On town sites where basements occur over the whole area, secondary access is often provided through the basement, to avoid wasting ground-floor space; a single entrance is usually provided, so that easy control is possible and this gives access to circulation corridors passing the various service stairs and lifts.

The basement approaches are even elaborated into carriage-ways, as shown in Fig. 6, so that deliveries may be taken directly to each service lift by tradesmen's vans and that carts may collect refuse from the bottom of each refuse shaft; an additional point achieved when this scheme is used for sites bounded by busy streets is that tradesmen's vans need not be parked for long periods outside the building. The service ways and the service staircases also serve as the alternative means of escape in case of fire.

### Forecourts

If sites can be developed to permit the use of forecourts such as those shown in Fig. 5, many advantages are gained. A more attractive approach is generally possible by careful layout and gardening, traffic to the flats is more easily handled, car parking is often made possible and street noise is to some extent reduced. Forecourts should be laid out in a formal manner without undue elaboration and with a view to economical upkeep. Concrete roadways are most satisfactory, as their appearance may be reasonably pleasant as opposed to tar macadam and the upkeep is less than if gravel is used. Grass is not very expensive in upkeep, but flowers, although possibly necessary in small quantities and helpful in general effect, are a considerable charge on the owners, who usually bear the upkeep costs.

Forecourts and gardens add greatly to rental values and aid in letting. The general appearance of the building is usually enhanced and the outlook from windows is much more pleasant. (*See also* Part 1: Transport.)

### Car-parking

It is highly desirable to provide some facilities for parking the cars of callers at the flats. Large areas cannot, as a rule, be provided in schemes in central areas, but elsewhere, and especially in the suburbs, every opportunity should be taken to fulfil the need. Fig. 5 shows a good arrangement for parking a number of cars in a forecourt which can be worked with one-way traffic. The average car requires a parking space of 7ft. by 16ft. (*See* Part 1: Transport.)

### Courtyards

Planning round closed courtyards as suggested in Fig. 7 is not so satisfactory as forecourts and courts which are open on one side. Rooms overlooking these

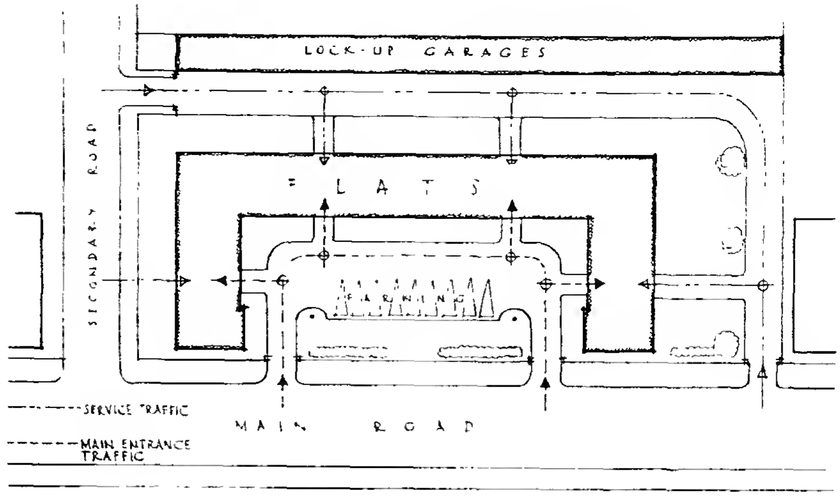
courtyards (and in point of fact any enclosed area) do not command such high rentals, as the outlook from windows is not attractive and the air is inclined to become rather stagnant. Sunlight is difficult to provide for windows on lower floors without exceptionally large courtyards. The courtyard rooms are often believed to be quiet, but this is not the case if traffic is permitted into the courtyard as suggested in the figure, more especially if traffic passes through the court to the garages at the rear of the site. Again, unless the courtyard is very large, the whole area is needed for turning space and thus attractive layout is difficult and car-parking impossible. If the main entrances to the flats are in the courtyard and cars are to drive up to them, the minimum width of the area should be about 60ft.

## Garages

Garages are more satisfactory if provided in the form of separate lock-ups rather than of the open type. Garages may be placed with great convenience at the backs of sites such as shown in Figs. 5 and 7 but are better if served by a separate roadway and not, as already mentioned, through the main courtyard. Garages, if placed at the back of the site as in these figures, require, in addition to a 20ft. roadway (which also serves as a work space), some separation from the buildings by grass or similar means; if the garages are too close to the ground-floor flats these are reduced in value owing to noise, smell and outlook; in any case it is better if main rooms do not overlook the garages.

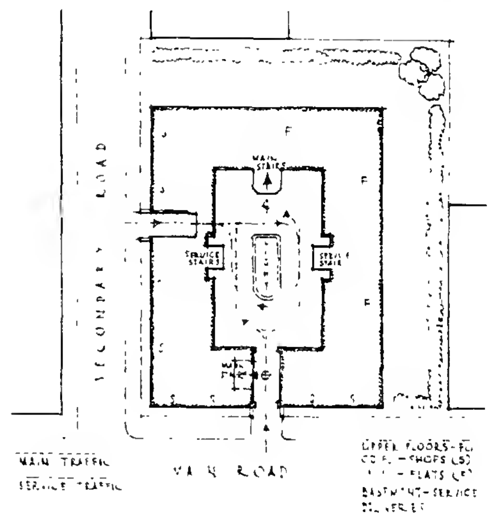
The major portion of the basement of a large block of flats is usable as garage space, though the space is difficult to lay out easily by reason of the supports needed for the flats above; in addition, the car ramps occupy considerable space, unless it is possible to place them outside the general mass of the block. This method requires extra consideration as to the fire-resisting qualities of the building and, in addition, generally (by reason of the space required) eliminates all use of the basement for purposes of storage, servants' rooms, caretaker's quarters, and so forth.

For information on dimensions of garages, *see* Part 1: Transport.

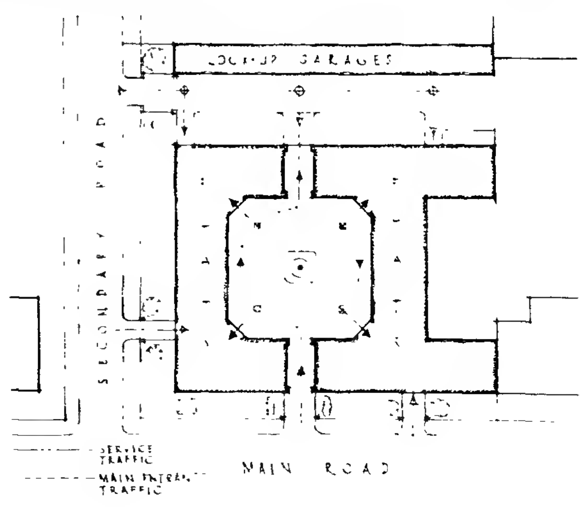



Above: Fig. 5 Approaches, forecourts, garages and parking

Right: Fig. 6 Approaches, forecourts, garages and parking




Below: Fig. 7 Central-court type blocks of flats with shops and basement deliveries



RENTAL-PRODUCING SPACES OTHER THAN SHOPS, TYPES OF ACCOMMODATION, ROOM AREAS

### Rental-producing Spaces Other Than Shops

There are many possible auxiliary sources of revenue (other than shops), in flat schemes, and these depend very much on the situation of the site. Bank and insurance company premises usually produce high rentals and are valuable and more suitable tenants than would be many types of shops. Corner sites are especially valuable for this type of letting. Such premises may be introduced into schemes which are of a purely domestic nature without detriment to the flats. In some streets the ground floor may be lettable as consulting rooms for doctors and dentists who will generally pay a higher rental than can be obtained for a flat in a similar position; separate approaches are desirable for such accommodation, leading directly from the street into private entrance halls and waiting-rooms, though in many positions the former may be one of the general entrances for the whole block of flats. The accommodation usually consists of a number of suites of one or two rooms grouped round communal service and waiting-rooms. Good light is important for all the rooms. The equipment necessary can, as a rule, be introduced into an ordinary room without very special planning, except for special electrical apparatus, which sometimes needs additional space and consideration.

Restaurants are rather a speculative proposition in the majority of flat schemes except when the flats are to be let as service flats or to be let to special tenants such as business women. Very few schemes are sufficiently large to provide sufficient internal custom and therefore they can be used only when the site is so situated as to attract passing as well as internal trade. Restaurants are usually more satisfactory if leased to a separate operator rather than run by the flat management. They can only be placed, as a general rule, on ground floors, with, perhaps, a mezzanine or gallery; this arrangement permits the kitchen to occupy basement space which is otherwise seldom very productive. Great care must be taken to prevent kitchen smells from the restaurant or its kitchen from reaching the flats on the upper floors.

Offices are not as a rule lettable if placed in flat blocks, except possibly to estate agents and then only if they are themselves managing agents for the flats.

Some extra rental also may be obtainable from basement or other store rooms for the use of tenants, but the rents charged are generally very small and they barely cover the capital outlay of building and equipment costs; but even this means the avoidance of dead loss on what would otherwise be useless or wasted space. In high-rental schemes, extra bedrooms for servants (usually men-servants) are frequently provided and leased separately to tenants. These rooms are often grouped with the resident head-porter's flat, either in the basement or in a space impossible to develop as ordinary flats. It is usual to have one resident porter or caretaker in all schemes of any size, regardless of type, as it is desirable to have a responsible person always in the building, even allowing for the loss of rent frequently involved by the provision of porters' rooms. In some very high-class schemes additional bedrooms for tenants' guests are provided, but these are a very doubtful asset.

### Accommodation of Various Types

The number and type of rooms provided do not necessarily vary according to the class of flat required, as previously stated. The high-rental class includes small types having only one bedroom and one sitting-room, increasing up to seven or eight bedrooms and four sitting-rooms, while the tenement and lower-middle class accommodation is virtually the same in room numbers except as to the number of bathrooms and service rooms such as pantries. Situation, amenities, facilities, equipment and general finish are the governing factors in rental values.

The table on page 115 shows the usual distribution of rooms in any flat having a given number of rooms, from the smallest sizes up to the luxury class, but it must be borne in mind that there are many possible variations and also that there are much larger flats than those suggested, such as have been built in central London areas in the inter-war years. The commonest types for various classes of tenant are: for tenement, assisted and low-rental classes, Types E, H and I; for single business women such as secretaries, etc., Types A, B and C; for lower middle-class tenants, Types I, J and K, and for middle-class tenants, Types L, M and N.

Types A and B are most economically arranged on the corridor principle, as, if they are approached from ordinary staircase halls, the small number of flats served from each staircase or each floor is generally uneconomical, especially if the building is high enough to require lifts. Baths are sometimes placed in sculleries so as to reduce plumbing and economize space in the very small types which may be let at low rentals, and in tenement schemes, but on the whole, it is an unsatisfactory arrangement, especially if the occupants comprise more than two adult tenants with only young children, and it is wholly impossible in any type where a maid might be required. Similarly, W.C.s may be placed in bathrooms (except where the bath is in the kitchen), if the same limitation of the number of tenants is made. In any case a separate W.C. is generally preferred by all tenants and is important as a letting factor.

In large-type flats the kitchen, maids' bedrooms and maids' bathroom are generally formed into a suite of rooms and cut off as much as possible from the rest of the flat; it is owing to the formation of such suites that men-servants' accommodation is generally separated from the flats.

Sculleries, as apart from combined kitchen-sculleries, are only needed for expensive types and even then are not always provided. A serving pantry is generally considered to be much more useful if there is only sufficient space for either a pantry or scullery.

### Room Areas

The table, at the bottom of the page opposite, gives average room areas compiled from past examples and from the " Housing Manual."

## TABLE OF ACCOMMODATION FOR VARYING TYPES OF FLAT

| Type | No. of rooms | Living-rooms | Dining-rooms | Kitchens | Bedrooms | Baths | Sculleries | W.C.s | Notes |
|---|---|---|---|---|---|---|---|---|---|
| A | 1 | 1 | — | Recess in living-room | Recess in living-room | 1 or common to several | — | 1 or common to several | May be corridor type |
| B | 2 | 1 | — | ditto | 1 | 1 | — | 1 may be in bathrm. | May be corridor type |
| C | 3 | 1 | — | 1 with bath | 1 | — | — | 1 | |
| D | 3 | 1 | — | 1 | 1 | 1 | — | 1 may be in bathrm. | |
| E | 4 | 1 | — | 1 | 2 | 1 | — | 1 may be in bathrm. | |
| F | 4 | 1 | — | 1 | 3 | 1 | — | 1 | |
| G | 5 | 1 | 1 | 1 | 2 | 1 | — | 1 may be in bathrm. | |
| H | 5 | 1 with range | — | — | 3 | 1 | 1 | 1 ditto | |
| I | 5 | 1 | — | 1 | 3 | 1 | — | 1 ditto | |
| J | 5 | 1 | — | 1 | 2 and 1 for maid (small) | 1 | — | 1 | |
| K | 5 | 1 | 1 | 1 | 2 | 1 | — | 1 may be in bathrm. | |
| L | 6 | 1 | 1 | 1 | 2 and 1 for maid (small) | 1 or 2 | — | 1 or 2 | |
| M | 7 | 1 | 1 | 1 | 3 and 1 for maid (small) | 1 or 3 | 1 | 2 | |
| N | 7 | 1 with or without lounge-hall | 1 | 1 | 4 | 1 to 3 | 1 and pantry | 1 to 3 | May have cloaks off hall |
| O | 8 | 1 ditto | 1 | 1 | 5 (2 maids) | 2 or 3 | ditto | 2 or 3 | ditto; sometimes with separate men-servants' rooms |
| P | 9 | 1 or 2 ditto | 1 | 1 | 5 or 6 | 3 | ditto | 3 | ditto; ditto |
| Q | — | Variation of " P " (9 rooms) or Large Types with more than 8 or 9 rooms | | | | | | | |

## TABLE OF AVERAGE ROOM AREAS

| Class of flat | Room | Average area | Minimum desirable dimension (width) |
|---|---|---|---|
| | | *sq. ft.* | *ft. in.* |
| High Rentals | Living-Room .. . | 325 | 15 |
| ,, ,, | Dining-Room .. .. .. | 270 | 14 |
| ,, ,, | Bedrooms (Large) .. .. | 270 | 15 |
| ,, ,, | Bedrooms (Small) .. . | 120 | 9 |
| ,, ,, | Kitchens .. .. .. | 175 | 12 |
| Medium Rentals | Living-Room .. .. .. | 300 | 15 |
| ,, ,, | Dining-Room .. .. .. | 225 | 14 |
| ,, ,, | Bedrooms (Large) . .. | 220 | 13 |
| ,, ,, | Bedrooms (Small) .. .. .. | 100 | 8 6 |
| ,, ,, | Kitchen .. .. .. .. | 150 | 11 |
| Low Rentals | Living-Room .. . | 160 | 11 |
| ,, ,, | Kitchen-Living-Room .. .. | 180 | 11 |
| ,, ,, | Living-Room (no dining space) .. | 180 | 11 |
| ,, ,, | Living-Room (with dining space) | 225 | 11 |
| ,, ,, | Bedroom (double) .. | 135 | 11 |
| ,, ,, | Bedroom (other double) .. | 110 | 10 |
| ,, ,, | Bedroom (single) .. . | 70 | 8 |
| ,, ,, | Kitchens (working type) .. .. | 90 | 8 |

## ENTRANCES, PLACING OF STAIRCASES

### Entrances

As already stated, the position of main entrances to blocks of flats of all types should be obvious to visitors approaching the building. Opinions vary as to the advisability of direct entrances to ground floor flats but it would seem, certainly in better types, wiser that all persons should pass through the main hall under the control of the porter, although some tenants might prefer the privacy of their own separate entrance. In smaller types it is often more economical to plan direct entrances to ground-floor flats or even to form maisonettes of the ground and first floors.

The main entrance is of great importance in all types, since prospective tenants and visitors are receptive to first impressions at this point. It should lead as directly as possible to the staircases and lifts; adequate space is needed for use by tenants and visitors waiting for lifts, cars or taxis and in better types ample room for a porter's desk should be provided. The position of this feature should be carefully considered from the point of view of ease of vision required for supervision of the entrance, lifts, etc.

Large lounges in connection with the entrances to blocks of flats are unnecessary and wasteful except in service flats as tenants usually wish to go as directly as possible to their flats and do not require accommodation for common use.

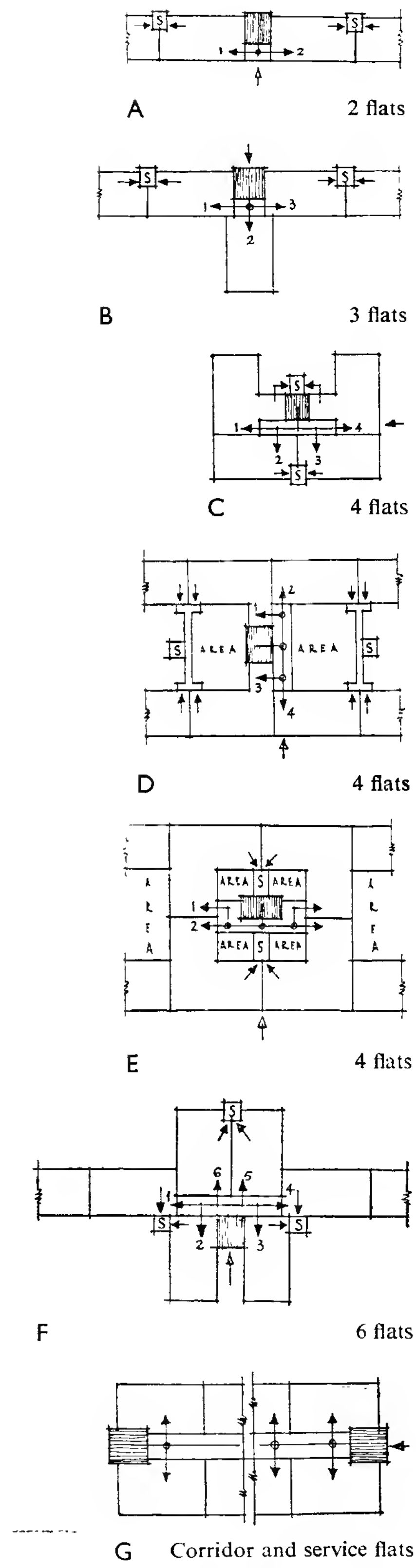
A draught lobby at the entrance is essential in order to prevent the entrance hall and staircase lobbies being uncomfortable, and also in order to reduce heating costs.

Lifts and staircases should be placed in positions easily seen by visitors on entering and should not be hidden away in small lobbies adjoining the entrance hall. It is seldom found necessary or desirable to have name boards in entrances, but frequently, especially in better types of flats, postal letterboxes are provided and connected with the various floors, if the building is high, by chutes. Access to the basement (if any), is not generally provided for the use of tenants (who reach it, if they need, by the service staircases), but secondary access at the main staircase for the porters to their mess rooms and locker rooms or to service rooms often saves a great deal of time and energy.

### Placing of Staircases

The efficiency of most schemes is dependent on the number of flats per floor served by each lift and main and secondary staircase and on the reduction to a minimum of corridor and public spaces. The greater the number served from each staircase hall, the less the proportionate cost per flat inclusive of public space.

The service staircases, which also form the secondary means of escape necessary for buildings having more than two stories above the ground floor, have a great influence on the layout and must be considered in conjunction with the main staircases. Type A in Fig. 8 is the simplest and commonest arrangement, having two flats only on each floor, with the secondary staircases placed between two such units; this type is largely used for low- and medium-rental schemes on fairly open sites. Type B has three flats to each main staircase, but has a fault in the fact that it is difficult and uneconomical to provide a secondary staircase to the projecting flat. Type C has four flats round the main staircase with two secondary ones placed between two flats. Type D, which is frequently used for crowded sites, has the advantage of four flats to each main and secondary staircase, except on end units; the secondary staircases are placed in the light wells between two units and are approached by bridge connections. Type E is often used on congested sites for high-rental flats; it has four flats round the main staircase with two service staircases in the areas backing on to and lighting the main staircase. Type F shows six flats placed round a main staircase, but it requires three secondary staircases; this scheme involves a very large amount of external wall and may be uneconomical from that point of view, even though a large number of flats is served from a single staircase. Type G illustrates the corridor method of arrangement useful for very small flats or service flats; staircases are placed at each end and the length is only limited by the usual requirement that no exit door should be more than 80ft. from a staircase.




Right: Fig. 8 Diagrams showing various possible numbers of flats served from one staircase, and methods of secondary escape

S—service (escape) stairs: —main stairs

### Staircases

For dimensions, *see* Part 1: Circulation.

### Lifts

One lift will normally serve 150 persons; *see* Part 1: Circulation.

### Public Corridors

The minimum width is 3ft. 6in. and 5ft. is more suitable. Corridors between the entrance and lifts should be 10ft. wide. The minimum size of entrance door to individual flats is 2ft. 9in.

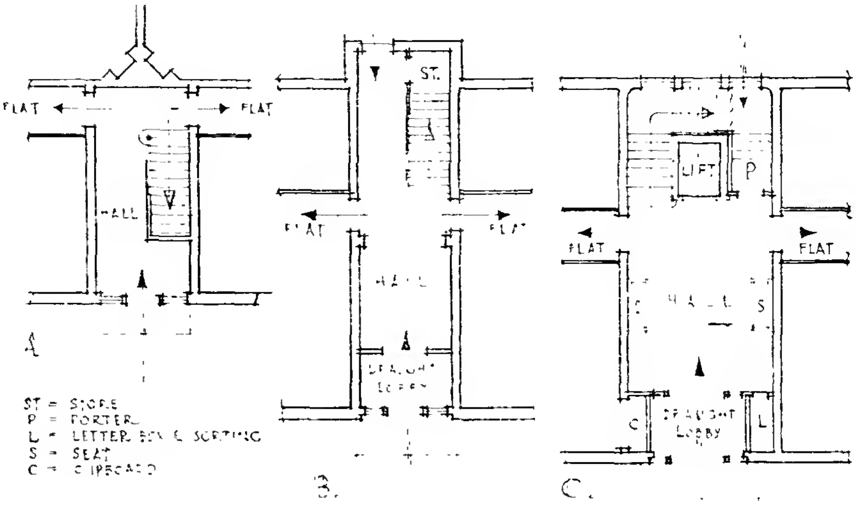
### Entrance Halls

Fig. 9 illustrates in Diagrams A and B two entrances of minimum desirable widths for lower-rental types where lifts are not required. The overall width is 8ft. in each case, with a staircase 3ft. 6in. wide, but this is frequently reduced to as little as 7ft. 6in. or even to 7ft.

In both examples basement access is possible if required, or the space may be occupied by a cleaner's store. A back entrance is possible in Fig. 9 B.

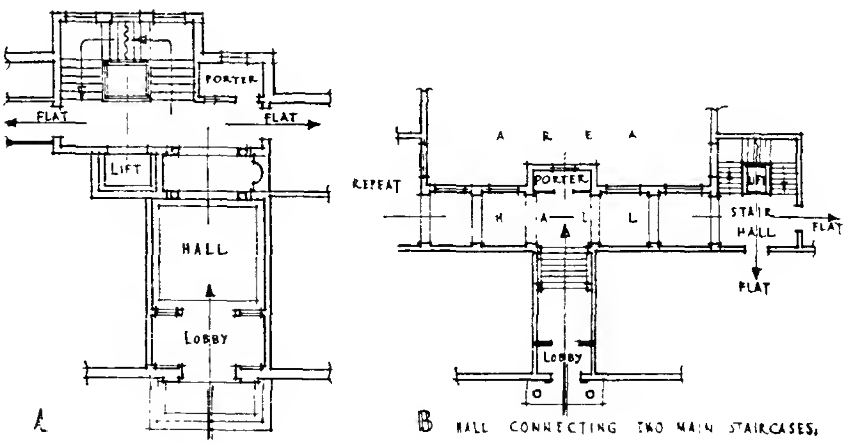
Fig. 9 C illustrates a larger type of entrance, where a lift is required. This scheme has an overall width of 12ft.

Fig. 10 illustrates two entrances of more elaborate types, which are suitable for high-rental flats. Diagram A is a type having one staircase from which only two flats open, but Diagram B shows a type serving two staircase halls, having two flats approached from each. Diagram A is definitely for a very expensive scheme; it has a good vestibule and waiting hall cut off from the lifts and ample space at the lift itself. The porter is well placed, being out of the traffic way, but at the same time he can keep control over the entrance, staircase and lift. Type B is typical of a layout frequently very useful, where one entrance serves two or more staircase halls, but can be controlled by one porter. The hall or gallery is well lighted from a central area, and is of good width (12ft.).




Above: Fig. 9 Types of small- and medium-rental entrances

Below: Fig. 10 Types of entrances to high-rental flats



### Balcony Approach

Balcony approaches are very frequently used for low-rental types, and have been used in a few medium-rental types. The balconies are reached by one or more staircases according to the size of the scheme, and from them open the individual flat entrances. It is a very economical method of access, but has the disadvantage that tenants must pass in front of the windows of other flats. This disadvantage is of little importance if the windows overlooking the balcony are confined to kitchens and rooms of a similar nature; but in no case should they be bedroom windows. The balcony system can be used in conjunction with maisonettes, so that the balconies may be omitted on alternate floors and therefore cannot pass in front of bedroom windows. Another objection to balconies is the shading of the windows beneath them, though this is not of much consequence.

### Design of Balcony

The width of balconies depends partly on the number of flats to be reached, but the minimum and usual width is 3ft. 6in. They are generally formed by continuing the floor construction to form a cantilever and turning up the outside edge to form the balustrading, which should, preferably, be solid.

### Staircases to Balconies

The staircases connecting the balconies must be cut off from all possible fire risks and when one only is provided, it is sometimes placed in a tower, cut off from and on the opposite side of the balcony to the flats. Staircases may often be placed in dark corners of courtyards and are usually connected together by continuous balconies at the third-floor level to provide alternative means of escape.

### Layout of Balconies

Part of Fig. 11 illustrates the plans of the usual arrangement of balconies, with continuous balconies connecting two staircases at the third and upper floor levels, to permit of secondary means of escape. The remainder of the figure shows three alternative sections frequently adopted. Type A, the most usual, has flats on the lower three floors and maisonettes occupying the upper two floors. This system requires balconies at the first, second, and third floor levels and a parapet gutter (minimum width for this purpose should be 12in.) or small balcony at the fifth floor level for escape purposes. Type B has flats on the ground floor only, with four floors above occupied by two maisonettes, thus requiring only two balconies; but it is doubtful whether this arrangement is any more economical than Type A, owing to the cost and space required for the internal staircases needed to reach the upper floor of each maisonette. Type C has only four stories occupied by two maisonettes requiring only one balcony. The fifth floor is occupied by a drying-room for washing. It is very doubtful if this scheme is very economical, as the wall thickness for four or five stories is generally allowed to be the same and one extra floor of accommodation is more profitable.

### High Flats

In high-density urban areas where land values are high the question of building dwellings above the three- or four-story limits already discussed arises. As has already been shown the number of dwellings which can be approached from any one staircase or lift has important reactions on both efficiency and economy. For this reason balcony approach, even with its disadvantages, is often resorted to; but for the purposes of high flats, which may be defined as any block over five stories high, flats served from staircases and lifts only become more possible. For example, generally two or three flats can be served from a staircase or lift on any one level; with four stories this means that only eight or twelve flats are served from one point, but with ten stories (a fairly normal high-flat limit) 20 or 30 flats may be so served. (*See also* Fig. 12.)

### High Flats and Maisonettes

Some economic advantages can be shown for the use of maisonettes instead of flats for all levels of high blocks. This applies to both lift-staircase types and balcony-approach types.

In the former type, main staircases and lifts need only land at alternate levels and, in the latter type, balconies (and therefore the staircase and lift landings) need only be constructed at each alternate floor.

There is also some economy in the construction of the actual floors, in so far as each alternate floor can (within each maisonette) be of lighter construction (for example, of timber). The internal staircase which is required for each maisonette can be of light timber construction, but its cost must be set against the saving of the alternate landings for the main staircases as well as for the lifts.

Fig. 13 shows some of these factors in diagrammatic form.

It should be noted that it is always difficult to plan flats and maisonettes over each other in the same block, due mainly to the various vertical services and framing grids of the blocks; but it can be done successfully when the development includes dwellings of many differing types of accommodation.

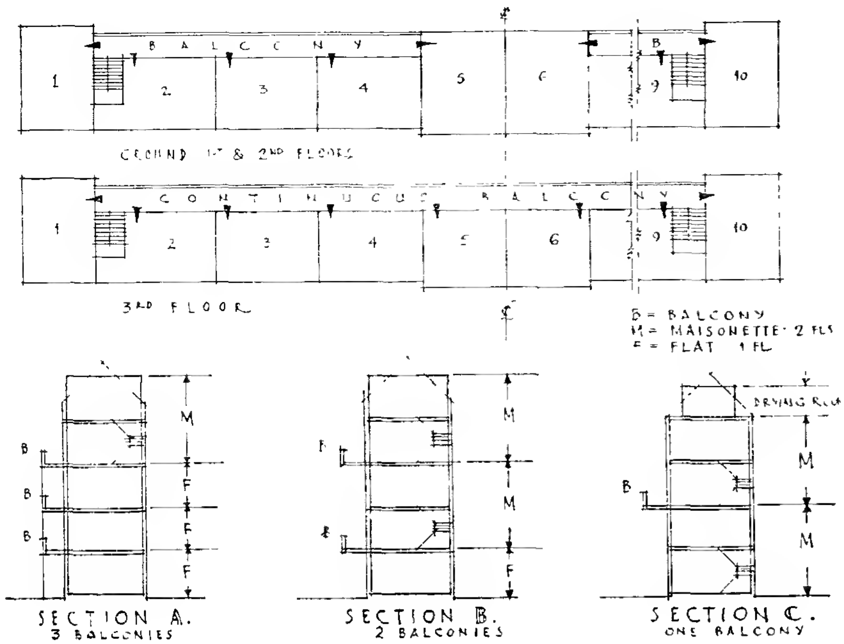
### Acoustic Considerations in High Blocks

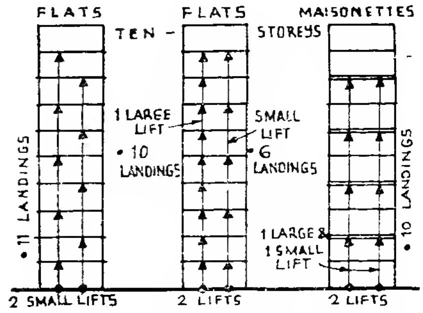
Although theoretically the transmission of both structure- and air-borne noises from one dwelling to another can be eliminated by the use of special materials and types of isolating construction, the high costs of such treatment often prohibit its use for lower- and medium-rental types. It is therefore necessary to ensure that the maximum safeguards are provided by the planning layout; this is particularly important in high blocks. Bedrooms should always be planned over or next to bedrooms, even when in adjacent flats; living rooms, kitchens, bathrooms, etc., should also be planned on similar lines.

Bedrooms should be planned to be some distance away from the main lift and staircase and from other service noises and should be insulated from internal corridors and living-rooms by cupboards or by other fitments wherever possible.

In blocks arranged as flats the types of rooms are easier to plan for acoustic protection both on plan and section than those in maisonette blocks. This is shown in outline in Fig. 14.

## BALCONY APPROACH, HIGH FLATS, MAISONETTES, ACOUSTIC CONSIDERATIONS

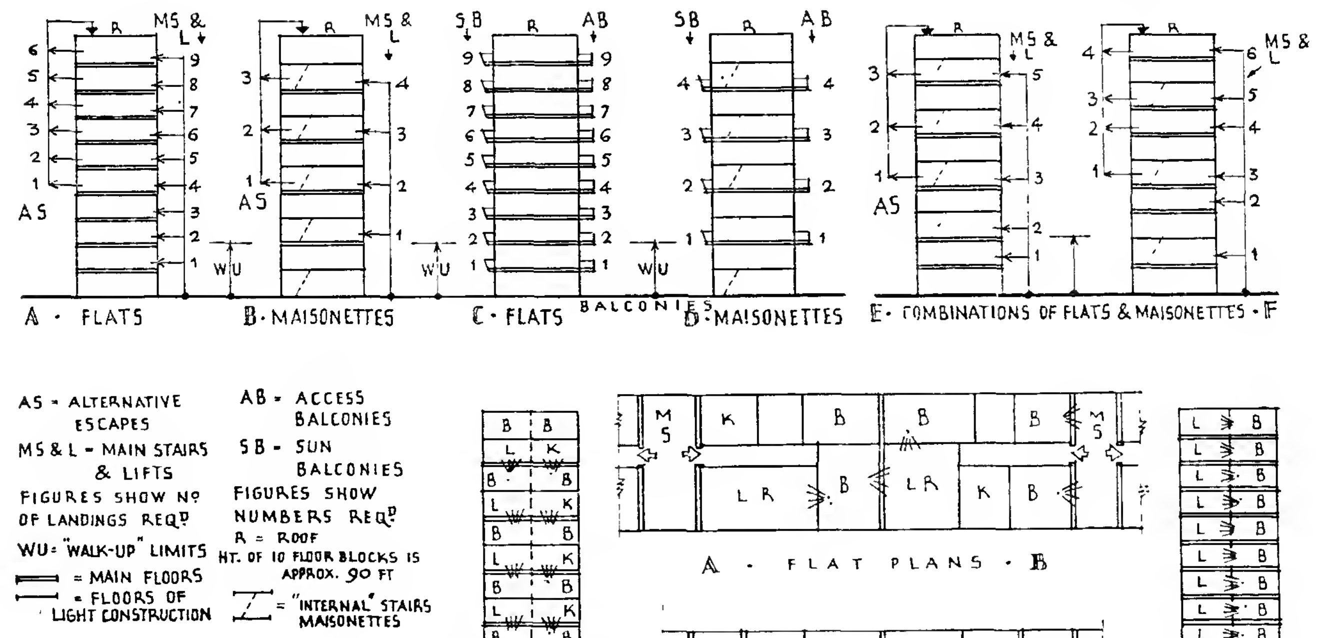


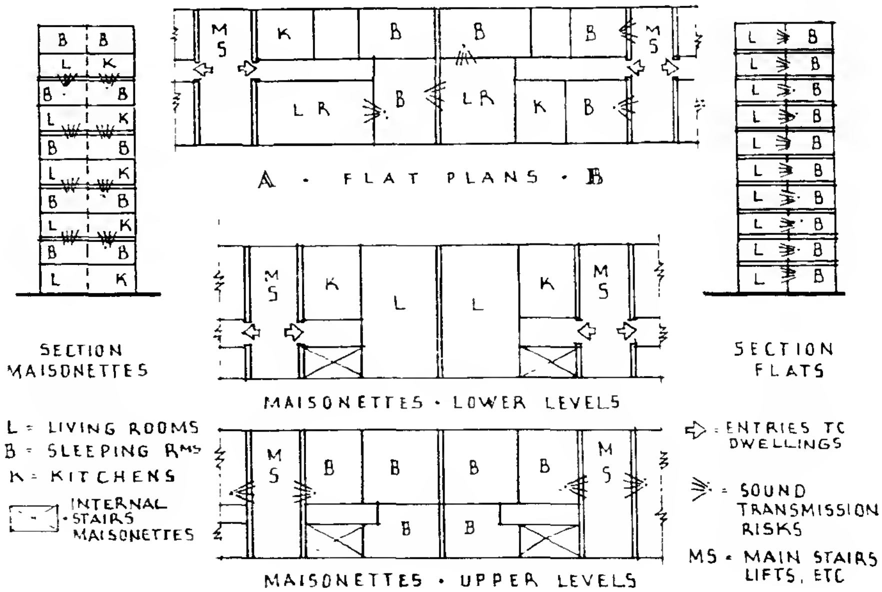




Above: Fig. 12 Lifts in high blocks

Left: Fig. 11 Flats and maisonettes with balcony approaches, showing positions of staircases

Below: Fig. 13 Flats and maisonettes in high blocks




Right: Fig. 14 Sound transmission in flats and maisonettes

### Emergency Escapes from High Blocks

Alternative means of escape from flatted dwellings should always be provided wherever possible. This is easily managed where balcony types, of whatever height, are considered, but it is more difficult in the case of high blocks with staircase approaches only. Where flat blocks are over three stories in height (or 42ft. from the ground level in the L.C.C. area) alternative escapes should be provided. From fourth- or fifth-floor flats this can often be provided by means of short balconics to allow communication (on the exterior of the building) between one flat and the next, provided the two flats have access to separate staircases.

Above such levels, however, it is usual to provide separate escapes upwards to the roof of the block by means of a small secondary staircase accessible only to those flats or maisonettes approached from each main staircase. This secondary staircase must be entirely cut off from the normal means of approach by main staircases and lifts. The roof should have well-defined access ways to facilitate alternative escape by means of any main staircase down to ground level; this alternative way down must not be assumed to include the main staircase which is allied to the secondary escape staircase used for escape upwards. No alternative access from the roof to any secondary staircase should be possible. (*See also* Fig. 13 on the previous page.)

### Lifts

The detail dimensions and the design of lifts are considered in Part 1: Circulation. Fig. 12 shows a diagrammatic summary of lift planning.

### Fire-fighting in High Blocks

In the layout of groups of multiple dwellings roadways should be at least 10ft. wide; or there should be a paved courtyard, extending for the full length of each block. The minimum space between buildings or between site boundaries and buildings within which fire escapes can be operated is 20ft; 15ft. is the maximum width of a forecourt across which such escapes can be operated from a street or adjoining site.

Blocks which are two flats deep should have an access roadway on either side. Lamp-posts, service poles or trees should not be placed so as to impede access for fire-fighting apparatus. Turning spaces or changes in direction of roads should be designed for the turning circles required by the local appliances (*see* section on "Fire Stations"). Gateways should be at least 8ft. 6in. clear width and preferably more.

The special requirements of high blocks (exceeding 42ft. in the L.C.C. area) must be considered on the merits pertaining to each individual case, but the following general principles should be noted:

For blocks one flat thick, a road or reinforced courtyard strip on one side, or if two flats thick, on both sides of the block, capable of bearing the weight of a 100ft. turntable ladder (12 tons) should be planned. To enable this apparatus to operate, the road or strip should be not less than 16ft. or more than 33ft. from the building to the road-edge nearer to the building; 20ft. is the most satisfactory dimension for this purpose.

Dry-rising mains are sometimes included in the design of high blocks over five stories and in large schemes "private" hydrant points are sometimes provided within the site curtilages; adequate road access to the latter (if not already sited in roads) should be provided.

Above the height of 100ft. (approx. ten stories), flat blocks may require special fire-fighting facilities and planning for escape.

It is wise for designers of extensive schemes or of high blocks to consult with local fire services at an early stage of the project.

### Service Entrances, etc.

The service entrances and staircases not only provide secondary access for staff and tradesmen, but also allow a secondary means of escape and therefore they must be designed to satisfy the fire authorities. Service staircases are not required for low-rental types and in these all deliveries must be made to the main entrances to the flats. In all better-class flat blocks it is essential to separate goods from general circulation. Occasionally blocks of flats have been built where the service staircase and lifts deliver on to the main circulation corridors and it is a method very much criticized by tenants. Service entrances should be well separated from the main entrances and, if possible, be approached from secondary streets or private access roads.

### Service Staircases and Lifts

Service staircases and lifts should deliver as close to the kitchens as possible, to give easy access both for tradesmen from outside and for tenants working in the service portion of the flats.

Service staircases may be of any fire-resisting materials, such as concrete or metal, the selection of which is generally dependent on the position. External ones are generally metal, especially if placed in areas, so as not to obstruct more light than absolutely necessary. Iron staircases are, however, rather noisy and are therefore disliked by many tenants.

Service lifts are needed for all better types of flats, even if only three stories high; but if they have to serve four or more floors they should be power-driven. Lifts of small dimensions carrying loads of about three or four hundredweights are sufficient except for high-rental types, where lifts sufficiently large to carry all ordinary pieces of furniture should be installed to eliminate possible damage to passenger-lift cars which otherwise have to be used for such purposes.

Service staircases must have daylight and natural ventilation, or they must be placed externally, in open areas or light wells. Fig. 16 on page 121 shows various common arrangements of service staircases and lifts in relation to the kitchen entrances of the flats. It should be noted that frequently the secondary access can be arranged very conveniently behind the main staircase, as in Examples A, B, and E. The lifts are generally most easily placed in a well with the staircase round it. A service staircase can seldom be arranged to serve more than two flats on each floor. Type A shows a usual arrangement of placing the staircase in an internal area and enlarging the platform to accommodate the dustbins. Type B is an ordinary escape staircase placed between two projecting wings

and connected by platforms to the flats at each level. The platform is kept away from the window of the main staircase to reduce the obstructions of light and the risk of fire making the platform impassable if the main staircase window breaks under excessive heat; the platform is widened near the entrance doors to accommodate the dustbins. Type C is similar to B except that the buildings are closer together and less platform is required.

Type D is frequently used when the service staircase must be placed on a main façade; it is enclosed entirely within the building. It is lightened and ventilated by an enlarged opening, in front of which the dustbins are placed. It also overcomes, by being in a ventilated area, a difficulty often met with in the placing of the secondary W.C.s.

Type E is suitable for a very crowded site, the staircase being placed in an internal area, which it occupies almost entirely. In such a case an iron staircase of a type permitting the maximum amount of light to pass through it is essential. *See also* Part 1: Circulation.

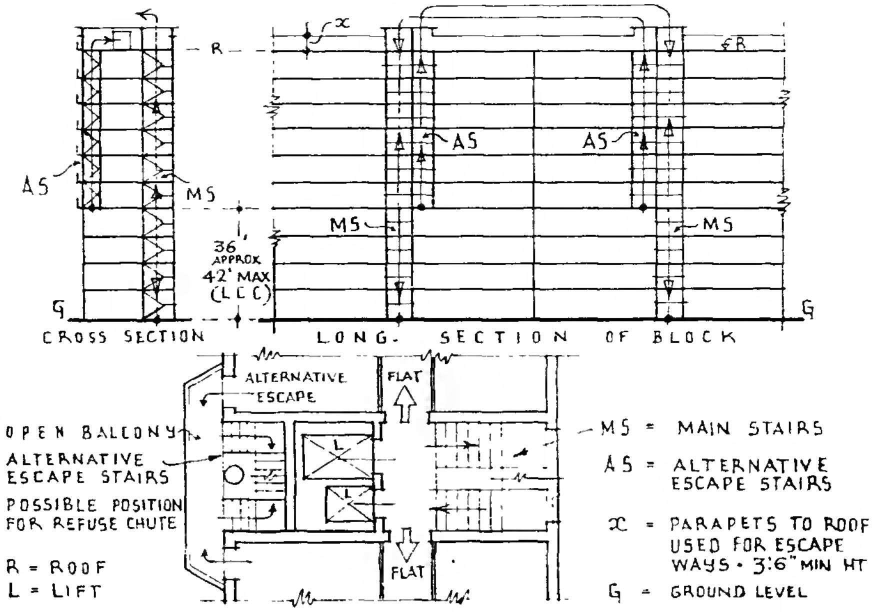



Fig. 15 Emergency escape in high blocks with staircase access

### Service Rooms

The amount of space needed for accommodation of communal services varies very much according to the type of flat required in any scheme. Low-rental types need drying-rooms for laundry. All schemes need spaces for boilers, fuel, a small workshop, transformer and meter rooms, porters' and cleaners' rooms, and some storage space. All these rooms may be placed in basements where excavation is possible. In addition to the communal service rooms, storage space for such articles as fuel and trunks is frequently needed for the individual flats. Artificial light is sufficient for these rooms, as they are little used, but good ventilation and dryness are essential. Trunk-rooms varying from 60sq. ft. to 100sq. ft. in area are amply large enough if they are properly fitted with racks for the trunks.

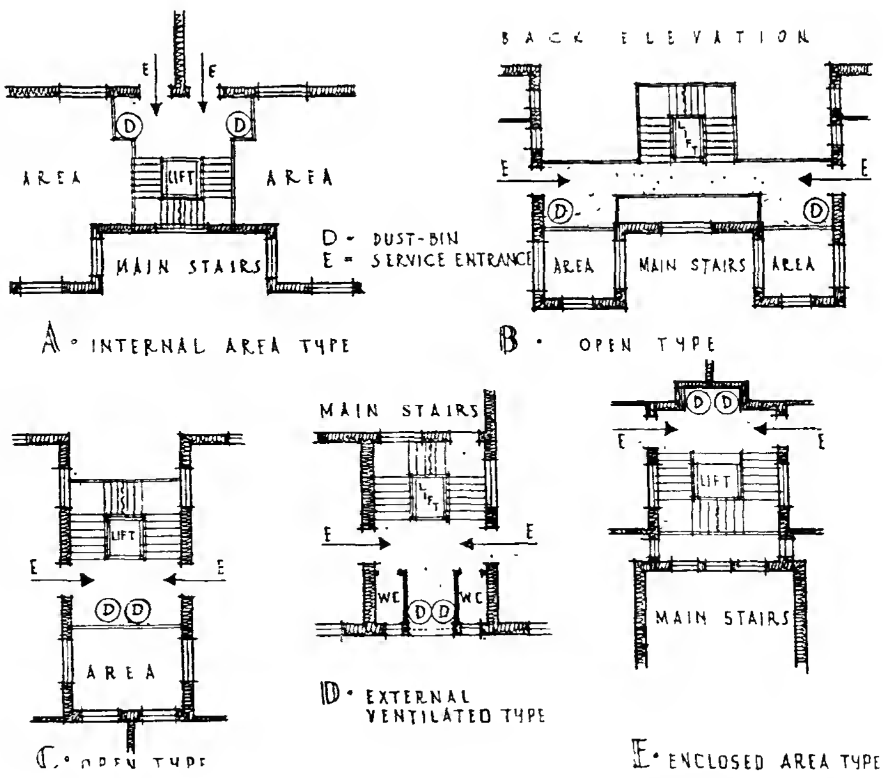



Fig. 16 Types of service staircases, lifts, etc.

INDIVIDUAL FLATS: GROUPING OF ROOMS

### Grouping of Rooms

Aspect for rooms frequently presents difficulties in flat-planning; ideal aspect cannot always be given to all rooms, but preference should be given to living-rooms. Considerable attention usually has to be paid to the grouping of services, and the concentration of drainage and plumbing is one of the most important factors.

The accommodation in a flat may be classed under three headings: living-rooms, bedrooms, and service rooms, the last including kitchens and maids' quarters. These groups should be carefully related each to the other and each room in each group related to the other rooms in the group. Bedrooms, together with bathrooms, are essentially for the use of the inhabitants of a flat only and should therefore be cut off as much as possible from living-rooms to which guests have access in addition to the tenants. Living-rooms should adjoin entrances to flats, but should not, excepting in low-cost schemes or in the case of lounge-halls in better classes, become corridor rooms.

In low-cost schemes great economies may be derived by entering rooms directly from the living-room, since all corridors and their cleaning are eliminated; but such an arrangement is apt to make the living-rooms cold and draughty, besides being rather unhealthy and unpleasant, especially if cooking is done in them: and it should not be necessary to enter the living-room when passing from a bedroom to a bathroom. Such an arrangement is only satisfactory for small flats with not more than one or at the most two bedrooms. It is an advantage to group the living-rooms in a suite and open them from each other. Dining-rooms should be placed so as to avoid service from kitchens having to cross halls or corridors. The service group and domestic staff quarters should form a link between dining-rooms and service entrances and in higher-rental flats servants should be able to reach front doors without passing through or disturbing living-rooms.

The greatest economies of internal planning and space-saving are gained by the reduction of corridor and connecting spaces to a reasonable minimum, but excessive elimination generally reduces privacy and comfort. Living-rooms should always be placed near entrances and not so that visitors

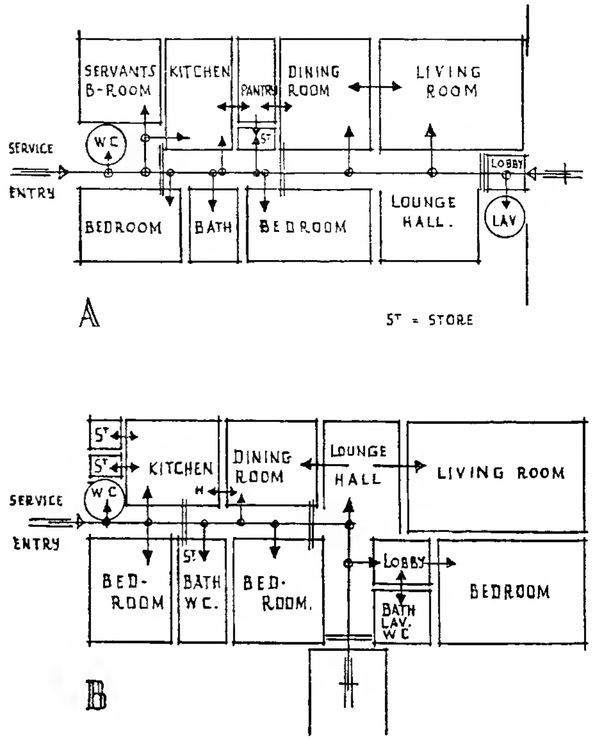



Fig. 17 High rentals. Typical analysis diagrams showing relations of rooms, etc.

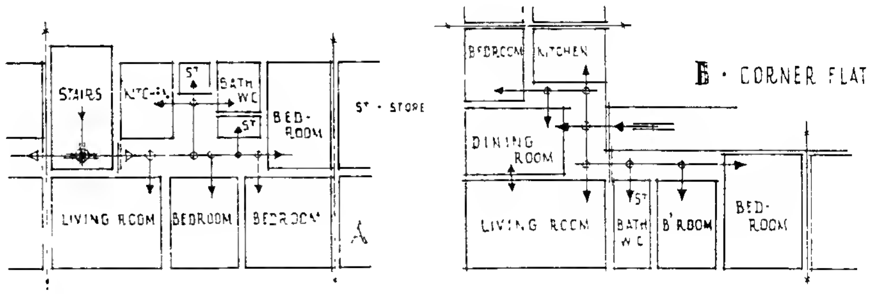



Fig. 18 Medium rentals. Typical analysis diagrams showing relations of rooms, etc. N.B.—no service entrances

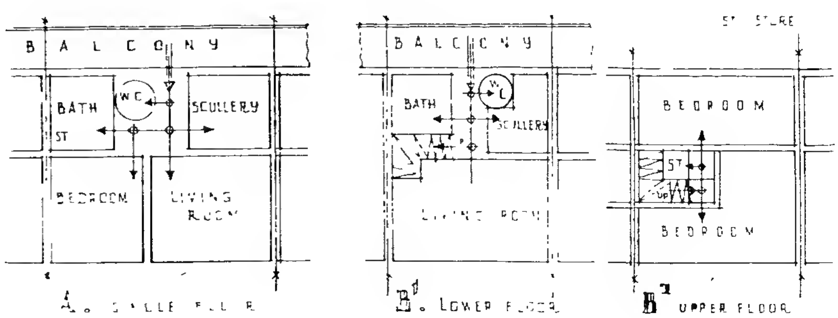



Fig. 19 Low rentals. Analysis of single- and two-floor dwellings

have to pass the doors of bedrooms and bathrooms.

Figs. 17, 18 and 19 show typical analysis diagrams of the relationship of the various rooms in different types of flats. Fig. 17 illustrates two high-rental types, of which Type A is the better. The entrance is through a small draught lobby (with a lavatory attached) into a lounge-hall. The living-room is entered directly from the hall, as also is the dining-room, the latter having direct communication with the living-room on one side and the lounge on the other. The main bedrooms are grouped round the bathroom and cut off from the remainder of the flat. The kitchen is close to the service entrance and has its pantry on one side and the maid's room on the other, all of which again form a group cut off from the remainder of the flat. Each of these types, owing to the use of a lounge hall, has natural lighting for the entrance and internal corridor. Type B in Fig. 17 is less well arranged, as service from the kitchen and ordinary bedroom quarters has to cross the entrance hall to reach the main bedroom; the private bathroom attached has to serve also as cloakroom for the hall.

Fig. 18 shows two typical medium-rental types of flats without separate service entrances. In Type A corridor space is reduced to a minimum and arranged to do away with any appearance of being a narrow passage; whereas in Type B there is a considerable amount of space occupied by access corridors.

Type A is small, having one living-room used also for dining purposes; the fault in this layout is the necessity of food service having to cross the hall; this, however, can seldom be avoided. Type B has the rooms well grouped together and each group may be cut off satisfactorily.

Fig. 19 illustrates the low-rental class of flat based on the balcony approach which is so commonly adopted for tenement schemes. Diagram A shows the typical plan used for the lower three floors and Diagrams B 1 and B 2 the two topmost floors planned to form a maisonette. The arrangement of the rooms is similar in many respects to other types, but the slightly different uses of the rooms must be borne in mind, while economy of space and equipment are primary factors.

### Heights of Rooms

Low-rental class flats generally have rooms with a clear height of 7ft. 6in. from floor to ceiling, although this height is sometimes made 8ft. 3in., while in some districts, where rooms are placed in roofs, they are frequently made 8ft. high in the clear. For medium-class schemes a general average is 10ft. from floor to floor, so that the rooms are about 9ft. 3in. in the clear, depending on the type of floor construction adopted.

In luxury types of flats greater heights are desirable, and a common unit is 11ft. from floor to floor, but frequently this is not obtainable, as the high site cost makes it essential to have the maximum number of floors to produce an economical scheme in the total height of the building.

### Entrance Halls to Individual Flats

In tenement and low-rental types space does not permit an entrance hall to be formed and it consists of the minimum passage-way (usually about 3ft. 6in. wide) necessary to give access to the various rooms, but in all other types a small hall is desirable where callers may wait and to provide accommodation for hats and coats, telephone, etc. The hall is sometimes enlarged to form a lounge in the larger types, but the room thus formed is often impossible to use for sitting-room purposes, owing to the numerous doors into other rooms making the hall a passage-room, and therefore somewhat uncomfortable. Where only one living-room is provided, the lounge-hall is frequently used as a dining-room, to prevent the smells of cooking being admitted to the only sitting-room; any room used for this purpose must have adequate daylight. Coat cupboards are of importance in all entrance halls, while the higher-rental types need also a lavatory and W.C. Coat cupboards should be at least 12in. deep and in multiples of 21in. wide if coats are placed against the back wall, or 21in. deep inside if coats are hung at right angles to the back wall. Shelves are needed for hats.

### Corridors

Internal corridors or passages should be reduced in length to a minimum. It is seldom economical to plan a flat so that the access corridor is properly lighted by windows, but the space so saved and consequent reduction of the flat rental seems to justify the cost of artificial lighting and the lack of direct ventilation. Borrowed light, however, may often be provided by glazing living-room doors with obscured glass or by fanlights placed over some of the doors. Corridors should be at least 3ft. wide, and 3ft. 6in. is much more satisfactory, as it is difficult to turn furniture into doors from narrow passages. Floor materials should be chosen to reduce noise and should be very hard-wearing.

**Individual Rooms**

The planning and general arrangement of domestic rooms have already been considered in the section on " Housing " and therefore only additional points particularly applicable to flats are discussed in this section. Shapes and sizes of rooms often cannot be ideal, owing to economies of construction and layout of services, but many of these difficulties can be overcome by close study of detail planning. As flats are planned for the unknown client, all eccentricities should be avoided and the plan should be evolved round the requirements of typical tenants of each particular class of flat.

**Living-rooms**

In most medium- and high-class flats only one living-room is generally provided in addition to the dining-room. The size will vary according to the type and class of flat, but it can be assumed that about 175sq. ft. is the minimum area for a satisfactory living-room, always provided that the least dimension is not less than 12ft., but, as shown in the table of average room sizes, the average floor area is 325sq. ft. in high-rental, and about 300sq. ft. in medium-rental schemes. In general all living-rooms should be of reasonably simple shape, without an undue number of breaks or recesses in the walls on plan. A certain amount of shaping by internal " trim " is allowable, but circular, niche-ended, octagonal, or eccentrically angled rooms are difficult to furnish and to fit with carpets, and are, therefore, less acceptable to tenants. In luxury types living-rooms may be made slightly in excess of the area really necessary, thus enabling the individual tenant to reshape the room as desired without cutting down the floor area to an unreasonable degree.

The living-room can be connected to the dining-room (or lounge-hall) by folding doors to enable a large area to be available when required. Such doors are inconvenient as the normal access to rooms, and, if possible, an ordinary single door should be provided in addition, which may connect with the hall or the internal corridor.

The living-room in low-rental classes usually has to serve also as dining-room, especially when the kitchen is too small to permit of accommodation for meals. Owing to this combined use, an area of 225sq. ft. is the minimum which is satisfactory.

**Heating**

It is now normal to install central heating in all higher- and medium-rental types and in many lower-rental blocks. If central heating is not provided, solid-fuel fires, often with back boilers for hot-water, are installed. " District heating " by means of central plants burning coke or using electric-thermal storage or heat-pump methods facilitates full or partial central heating throughout large development schemes and the adoption of such methods may be greatly extended in the future.

If any open fireplaces are provided, the solid-fuel type, requiring a full-size flue, will, generally, be needed only in the living-room.

These rooms, therefore, will be more convenient and economical in flue arrangement if they are placed one directly above the other on each floor. (*See also* page 132.)

**Lighting**

Lighting in low-rental types must consist of ample daylight provided by windows, preferably placed on the long side of the room to allow of division, when arranging furniture, into sitting- and dining-sections.

Windows should be of ample size, especially in town areas and particularly for windows placed overlooking areas or courts on congested sites; here the usual ratio of 1/10th floor area should be increased to 1/7th or 1/8th. Two windows are better than one in a living-room, as ventilation is more easily regulated and adjusted to circumstances.

Artificial lighting should be of two varieties. Local lighting is tending to become increasingly popular and therefore several skirting plug points for table or standard lamps should be provided, though at the same time a general lighting system is also needed.

There is a tendency in many low-rental schemes to save money on the number of electric-light points provided in living-rooms of this class of flat. A central pendant is essential, but at least two plug points should be provided in addition.

**Dining-rooms**

Separate dining-rooms are provided in high- and medium-rental types, but only occasionally in the better flats in low-rental class. The position of the dining-room is important; it should be grouped between the living-rooms and the kitchen quarters and away from all bedrooms. It is more satisfactory if service does not have to cross the main corridor of the flat.

Dining-rooms in high-rental types average about 270sq. ft. in area, and should have a minimum width of 14ft., while in the medium-rental class the rooms average about 225sq. ft.

A built-in sideboard is a great asset to letting and a hatch may be incorporated in this fitting.

When dining-rooms are provided in the better flats of a low-rental scheme, the rooms should not be less wide than 12ft. to allow of comfortable circulation space for service on all sides of the table. The superficial area of the room will largely depend on the size of the remainder of the flat, but the length of a 12ft. wide room should be about 14ft. to dine six persons

**Heating**

As central heating is usually provided in the type of flat having separate dining-rooms, radiators or panel heating are sufficient for the usual use of the room. Provision should, however, be made for auxiliary heating by means of gas or electricity. Such fires should, if possible, be placed at the side of the room, so as to allow one end wall to be used for sideboards and the other for folding doors communicating with either the lounge-hall or the living-room, the fourth side of the room being required for windows.

**Lighting**

Artificial lighting of the dining-room should be by general lighting, with auxiliary plug-points for lighting the table and sideboard.

**Furniture**

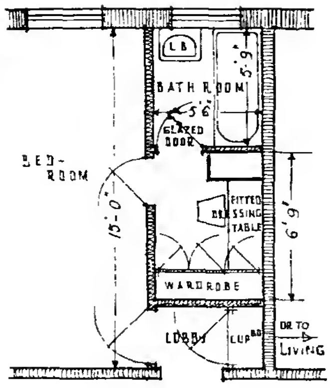
The dimensions of furniture for living-rooms and dining-rooms are given in Part 1: Furniture.

### Bedrooms

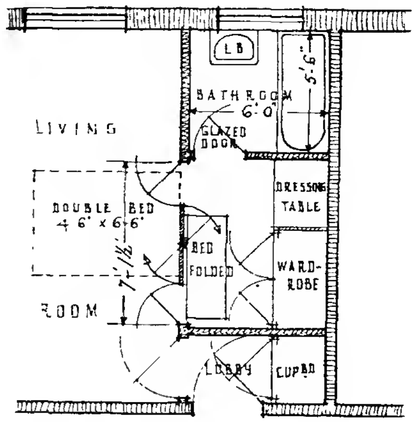
Bedrooms should be given, as far as possible, quiet situations in relation to surrounding roads; and the more important ones may well overlook internal courtyards if the latter are large and do not provide a bad outlook on to such things as service staircases.

Bedrooms in high-rental types of flat may be subdivided into three types, principal, secondary and those for maids. The first category usually have a private bathroom attached to each, and certainly in the case of the main bedroom, which frequently has a small bedroom or dressing-room in addition, to form a suite. In the second category the rooms should be grouped with a bathroom, while in the third they form a separate unit with the kitchen, again having a bathroom of their own. In medium-rental classes having three to five bedrooms it is important that at least two rooms should be large enough for twin beds. The average size of the main bedroom in a high-rental scheme is about 270sq. ft., and in a medium-rental scheme about 220sq. ft. The smallest bedrooms, which are those for servants, average about 120sq. ft. in high-rental flats and 100sq. ft. in medium classes, although there seems little need for these to be more than 80sq. ft. in area if they are each used for one maid only.

In low-rental types, if two bedrooms are provided, sometimes only one is made large enough for a double bed, but it is better to have two large rooms when three bedrooms form the sleeping accommodation. As only one bathroom is usual with this number of rooms, it should not be attached to any special room, although it is more convenient if placed close to the largest room, which is the one in most continuous use. The average size for the main bedroom is about 135sq. ft., but the least dimension should be not less than 10ft. 6in. or, better, 11ft. The smallest bedroom should not be less than 70sq. ft.




A SPACE SAVING IN A BEDROOM SUITE




B ADAPTATION OF SAME PLAN TO THE 'ONE ROOM' APARTMENT WITH FOLDING & DISAPPEARING BED

Fig. 20 The bedroom, bathroom and dressing-room

### Heating

Central heating is sometimes provided in bedrooms of medium-rental types and is usual in higher-rental types, but secondary heating, such as gas or electric fires, is usually provided in addition. Where no central heating is available, local gas or electric heating has become general.

### Lighting

Ample artificial lighting points are essential for all main and secondary bedrooms in medium- and higher-rental flats, both for general and local lighting for the bed and dressing-table.

All bedrooms in low-rental types should have at least two artificial light points, one for general lighting and the other for local lighting over the bed itself, the latter controlled at the bed-head.

### Lavatory Basins

It is general in all better-class schemes to equip each bedroom with a lavatory basin, except in rooms having their own private bathroom attached. A few tenants dislike having basins in bedrooms, but the majority appreciate the work saved and they are particularly popular in medium-rental types with proportionately fewer bathrooms.

### Cupboards

Built-in wardrobe cupboards should be provided in all bedrooms, if possible. The minimum cupboard space for a single room is 2ft. in width, 1 ft. 8in. to 1ft. 10in. in depth, carried to the full height of the room, with an upper cupboard above a height of 6ft. 6in.

### Dressing-rooms

Fig. 20 illustrates two examples of the small dressing-room; Type A being for a better-class flat, and Type B for use in conjunction with a bed-sitting-room.

In each scheme a bathroom is entered through the dressing-room, which is now permitted in most districts, as its use is limited by its situation to the one bedroom; but, if required, it is possible to ventilate the dressing-room over the bathroom and thus make it a ventilated lobby. A W.C. may be placed in either bathroom in most districts. In both examples, the dressing-room has to depend mainly on artificial light, but this need not be a very great disadvantage if properly designed equipment is used. Type B incorporates the folding bed.

### Bathrooms

The number of bathrooms required for each flat depends entirely on the type of scheme. Luxury flats frequently have one to each of the large bedrooms, one for the smaller bedrooms and one for the use of the maids. Middle-class rental types usually require at least two, one being attached to the servants' quarters; if, however, one only is provided for the bedrooms, other than those for the servants, it must not be attached to any particular room. In better-class types, bathrooms are not as a rule made to minimum dimensions, but in all other types the more space saved the better, so long as the baths are not less than 5ft. 7½in. overall.

Low-rental types sometimes have had the bath placed in the kitchen or scullery, but this should only be permitted in types having not more than one bedroom.

### W.C.s

Opinions vary as to the desirability of placing W.C.s in bathrooms. When only one is provided it should be separate, and if more are provided in large-type flats at least one should be separate. It is a good principle to provide a separate W.C. for the use of servants, which may be satisfactorily placed in the maid's bathroom, except in very large types where many servants are required. It is now generally conceded that the W.C. (if the only one) may be included in the bathroom where the flat contains only two or fewer bedrooms.

### Equipment of Bathrooms

The equipment and selection of fittings vary with rental value. High-rental types must have fittings of very good quality except in maids' rooms; while low-rental types may have the cheapest available, always provided that the fittings are suitable for hard wear and rough handling. Bathrooms which are private to one bedroom in luxury types, usually have a complete suite of four fittings, but bidets are at present seldom used elsewhere. Maids' bathrooms generally have only a bath and W.C., as wash basins are generally placed in each bedroom. Combined fittings consisting of lavatory basins and bath, the former discharging into the latter, are sometimes used in low-rental types.

### Artificial Ventilation of Bathrooms

Mechanically ventilated bathrooms which have been so common in American cities for many years, are now permitted in some districts in England, but the initial and upkeep costs of a mechanical ventilation plant are such that they are not an economic proposition except on very crowded and expensive sites and where buildings are the full height allowed under Building Acts or by-laws.

### Kitchens, etc.

Kitchens vary in floor area according to the class of flat, although the difference is not so great as in other rooms; high-rental, luxury-flat kitchens have an average area of 175sq. ft., with a pantry in addition, whereas the medium-rental ones average about 150sq. ft., but are often without a pantry. In low-rental schemes, however, the kitchens are usually reduced to the minimum area into which the necessary equipment can be placed, thus averaging 90sq. ft. in area; it is possible, however, by very careful selection and design of fittings, to reduce this area to as little as 40sq. ft. for small one-room flats and for bed-sitting-room types to what is virtually a large cupboard. The general layout of kitchens was discussed in the sections on "Housing," therefore only special points for flats and the very small types are here considered in detail. Fig. 21 illustrates a typical example of the layout of the servants' rooms, kitchen and pantry for a luxury scheme. Direct approach is given from the service staircase and lift to the kitchen, and a good layout of fittings for sequence of process in food preparation is arranged, with the refrigerator and larder adjoining the entrance door. Adjoining the kitchen is the service pantry, with which is grouped the maid's bathroom to facilitate plumbing and other services.

Fig. 22 shows a typical layout for the scullery for low-rental types. The cooking in low-rental types is usually done in the kitchen, by means of gas or electric cookers. Low-rental types usually need a wash-boiler as separate communal laundries do not seem popular among tenants.

### Kitchenettes

The kitchenette has been developed very considerably for smaller types of flats, especially for those having only one or two rooms or where maids will not be employed. The working efficiency of these small kitchens is mainly dependent on the complete and proper provision and placing of equipment.

The floor space provided is not so important as careful design of fittings, and the reduction of space occupied by the use of such equipment as folding tables, ironing boards which fold into shallow cupboards in the thickness of a partition, and small refrigerators which fit under sinks or into parts of kitchen cabinets or built-in cupboards.

All available space on walls and floors should be used for the placing of equipment, as may be seen from Fig. 23, and the clear floor space for working reduced to a minimum; even the ceiling may be used for the hanging of an airing-rail. Fig. 23 illustrates a kitchen of very small area—49sq. ft.—but, owing to careful placing of fittings, it is quite satisfactory for its purpose. The cost of equipment for such a kitchen is fairly considerable, but by careful selection and designing it will be found to be far less than would appear at first sight, particularly as there would be much repetition if a whole block of flats were to be similarly fitted up. The main equipment consists of a cooker with a ventilated hood over, which is particularly desirable in all small flats, a sink and draining-board under which the refrigerator is placed, a folding ironing-board, a broom cupboard and a kitchen cabinet which has a sliding top and eliminates the necessity for a table.

For the dimensions of sanitary fittings in bathrooms and kitchens, *see* Part 1: Sanitation. For general data on larders, *see* Part 1: Storage.

### Larders

The provision of a larder with natural ventilation often presents a planning difficulty. Larders are required in all types, even where refrigerators are

Fig. 21 High-rental flats. Typical layout of service-rooms, etc.

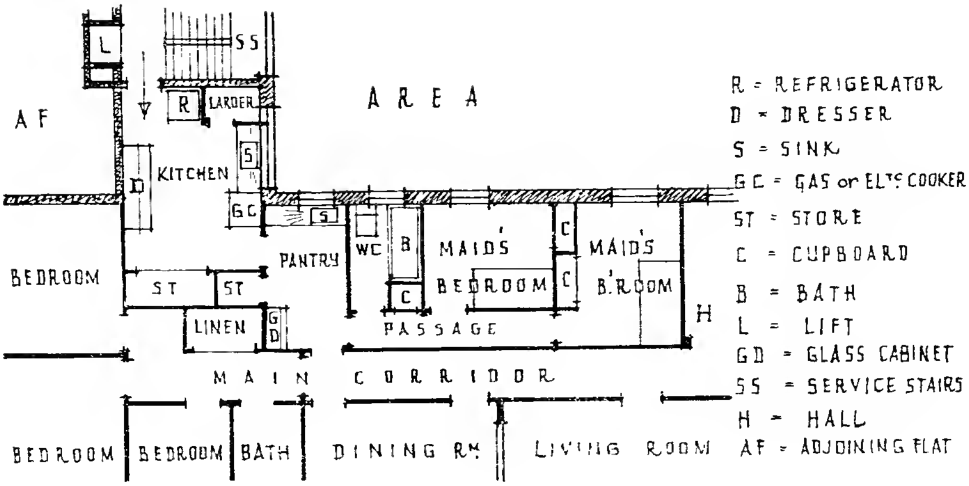
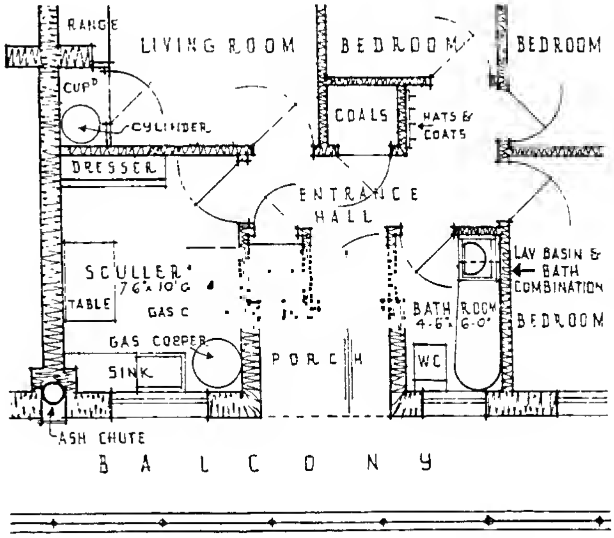
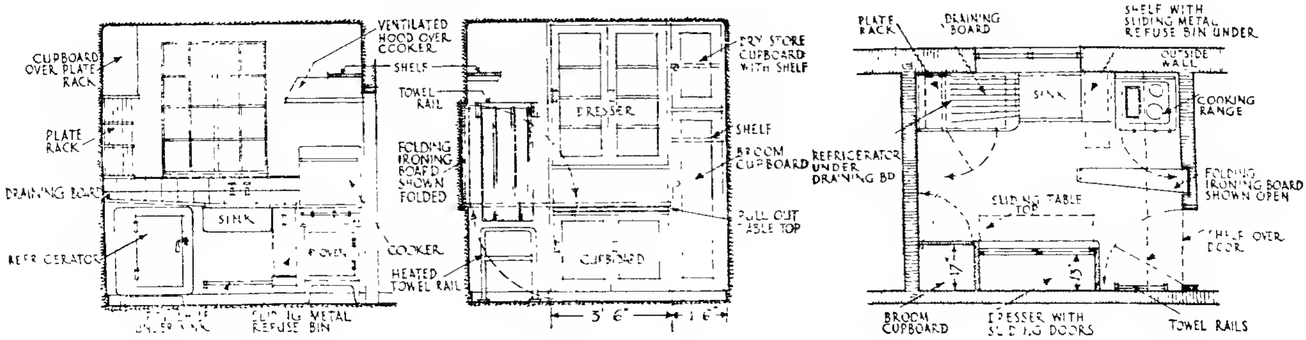



Fig. 22 Low-rental flats. Typical layout of service-rooms, etc.




Below: Fig. 23 Typical layout of essential fittings, etc. in a kitchen of small size for medium-rental flats



standard equipment, but windows are not always provided, reliance being placed on air-bricks at the top and bottom. Larders which are simply cupboards in small, hot kitchens are not very satisfactory, and in such cases it is better if they are entered from outside the kitchen.

### Heating

Large kitchens generally require some heating other than that provided by the cooking range, especially if the room is to be used also as a maid's sitting-room, so that radiators should be installed when central heating is available and in its absence a gas fire or electric radiator plug-point should be provided. A gas-cooker fitting which includes a small, open gas fire for heating the room is now on the market. Small kitchens, since they are not used for sitting-room purposes, do not require any heating, as the warmth generated by cooking is usually more than sufficient; but, if central heating is available or a gas or electric water heater has to be installed in the absence of a central system of hot water supply, advantage may be taken of it for heating the room and drying tea-towels, etc. Some such means of drying kitchen linen should be considered essential.

### Lighting

Kitchens require careful thought in the placing of light fittings to avoid shadows on working surfaces, such as tables, sinks, and cookers. Efficient lighting can seldom be obtained from the usual single ceiling point in the centre of the room, and some bracket points are needed in addition, especially in the larger types.

Points, either gas or electric, are needed for the cooker, refrigerator, iron and (in the lower-rental types) for a wash-boiler or washing machine.

### Special Equipment

In the larger types the equipment is similar to that needed in the kitchen of an ordinary house, excepting that it usually requires more careful arrangement, as there is less available floor space. In the smaller types, however, special equipment of a space-saving nature is particularly needed to economize floor area as much as possible. Each fitting must be designed for its exact purpose, and proper provision made for the contents of each. There has been a recent extensive development of the kitchen cupboard into the fitted cabinet, which may still be extended considerably before it is as complete as the equipment developed in other countries; where, for instance, a fitting may be obtained containing a cooker, a sink and draining-board, refrigerator, folding table and cupboards for stores, china, glass, linen, brooms, etc., the whole being about 6ft. in length, 1ft. 9in. deep, and 7ft. high. Many articles of equipment are already made in this country for building into fittings, such as the refrigerators mentioned above, which will fit either under sinks and draining-boards or into cupboards. Sinks and draining-boards are also now made in one piece and gas and electric cookers, which have the oven and boiling ranges side by side, high enough to fit over a pot cupboard, are now being sold.

### Stores, Cupboards, etc.

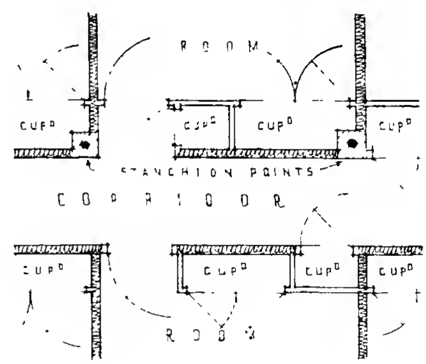
Ample and suitable storage space is essential in all types of flat, but especially in those of higher rentals. Ordinary houses have accommodation such as box rooms and roof spaces, but such space does not occur so readily in economically laid-out flat plans. Cupboards for various purposes, for clothes, linen, wine, etc., may frequently be arranged opening from the main internal corridor of each flat and placed between cupboards or wardrobes needed inside the rooms, thus forming an insulated barrier between the rooms and corridor noises, with a consequent saving on wall thicknesses, etc. (Fig. 24.) The placing of cupboards in these positions is specially useful in the bed-sitting-room type with centre corridor approaches, as in this type of flat the corridors are public thoroughfares. Cupboards in these positions also frequently help to provide unseen accommodation for the stanchions.

Cupboards for general purposes should not be too deep, but fairly wide; a good average depth is 2ft., but at least one deeper store is desirable for suitcases and large articles. Additional storage space is frequently provided in the basement, and leased separately to tenants for storage of large articles such as spare furniture and trunks. It is essential that such storage should be well ventilated and dry.

These stores should have an area of at least 40sq. ft., each with solid partitions between them, and should be fitted with strong shelving.

For detailed information about fuel storage, *see* Part 1: Storage.

Below: Fig. 24 Storage cupboards as insulation, etc. for corridors



### Refuse

The removal and disposal of household refuse from flatted dwellings is a problem which, mainly on account of its many difficulties, has received constant consideration for many years. The systems adopted, however, have shown, with one exception, little change, although some minor improvements have been introduced; these relate mainly to the methods of removal of refuse from the site and to its ultimate disposal in tips or destructors—matters which are, to a large extent, outside the scope of this book.

### Methods in Use

There are three general methods of household disposal now used in this country; (a) dustbins at each floor level; (b) dustbins at ground floor level; and (c) chutes delivering to bulk containers at ground or basement level.

A further method widely used in other countries, but not general here, takes the form of flues discharging into continuous burning incinerators in the basement or at ground floor level. The flues are the full height of the building, and at each floor level smoke- and smell-proof inlets are provided to receive the refuse, which, when the inlet is closed, falls directly on the fire. This method of disposal is mainly used in tall buildings where a number of inlets for refuse can be arranged one over the other; otherwise, with dispersed chutes or flues there would be insufficient material to maintain continuous burning.

The one new development, hinted at above, is a method of water-borne disposal, for example, the Garchey system. It requires a specially designed kitchen sink from which, in larger schemes, 6in. diameter downpipes convey both sink water and household refuse to a sump below ground level. The water-borne garbage is treated so that the surplus water is removed and passed to the ordinary sewers and the solid matter, after extraction of metals, is burnt in a special destructor furnace; the latter, if the scheme is on sufficiently large a scale, provides a source of heat which can be utilized in one of several ways. Such a system and its derivatives, is suited only to the largest schemes, where the capital cost of the plant and of the buildings and space required to house it can be spread over an adequate number of dwellings. These are more or less proprietary systems and, as they have been described elsewhere the details are omitted from these notes; the adoption of such methods does not affect flat planning to any great extent, though special site provisions may have to be made to house the plant for larger schemes.

It should be noted that neither of the last two methods of disposal lend themselves to the recovering of waste materials for salvage purposes.

### Disposal in Four-Storey Flats

For flat blocks not exceeding four storeys in height, there appears to be no alternative to dustbins in some form. Short chutes have been installed in some schemes; this is, however, a costly method for anything but high (6 to 10 storeys) blocks. All chutes are open to the objection that they are difficult to keep clean, and short three- or four-storey ones are doubly so.

Two forms of dustbin are in general use. The pail or " binette " type is usually installed in the kitchen; it has from ½cu. ft. to 1cu. ft. capacity and has to be periodically (usually daily) carried and emptied into large dustbins or special refuse containers elsewhere. Normally the Local Authority service does not collect or empty bins from any position higher than ground-floor level. In lower-rental flats the tenant is usually required to empty the small kitchen bins into the larger receptacles; in other types the porters or caretakers collect and empty the pails for tenants.

The other form of bin used in some flat schemes with few storeys is the standard " dustbin "; these are kept at the various floor levels, usually adjacent to staircases, and they are carried to the ground level by the maintenance staff (on a scheme of any size) at regular periods when the Local Authority's collectors are expected.

These larger bins are normally of 2cu. ft. or 2½cu. ft. capacity (*see* B.S. 792).

These dustbins are the containers into which the tenants empty their " binettes," and are usually provided by the Local Authority.

The main storage containers are designed to fit special lorries for removal, empty ones being left when the full ones are removed; the capacity of each container is about 1¼cu. yd. (B.S. 1136).

The bulk containers must, of necessity, be placed at ground-floor level, where they may be under cover (preferable) or in the open, according to site circumstances.

If dustbins are not installed at each floor level it is quite usual to place them, or the larger type of containers, near to ground-floor fuel stores, so that the tenant when taking refuse away can return with fuel to his flat; a single journey, once a day, only being then normally involved. The distances and differences of level to be traversed will, of course, vary considerably with the type of access to the flats—balcony or staircase—and with the type of dwelling adopted in the flat blocks. (*See* Fig. 25 and Part 1: Refuse.)

### Disposal in High Flats

In flat blocks of more than four stories other methods of collection and removal have been used. Firstly, standard dustbins, as before described, can be placed at the various floor levels; their removal and transport to the ground level is, in high blocks, facilitated by the existence and necessity of passenger lifts. Secondly, chutes with inlets at each level and with deliveries to ground floor or basement containers.

Chutes are probably more satisfactory than dustbins; the latter are difficult to accommodate satisfactorily on floors in such a manner that the contents of the dustbins do not become offensive. In general, the use of dustbins at each level is not to be recommended where the flat blocks exceed three to four storeys.

If the method is adopted, however, the dustbin positions should be planned near the staircases and lifts (or lifts, if these are separate from the staircases). The bins should be housed in a special compartment or shut off from the general public circulations, though, at the same time, they must be easily accessible to all tenant-users. The spaces in which they are kept must have permanent ventilation to the open air and be arranged so that the floors, etc., can be washed down regularly and easily.

Chutes or flues delivering to constantly-burning incinerators and water-borne systems have already been referred to above; both these methods

are suitable, other things being equal, for high flat blocks.

In each type (other than the water-borne method), unless a dustbin is provided for the exclusive use of each flat (*see* Fig. 26 A), it is necessary to provide small pail-bins or binettes in each kitchen, wherever the chute (of whatever type) is used by more than one tenant.

Fig. 26 A shows typical planning layout for dustbins on each level in staircase-approach flats and where balcony approaches are used (Fig. 26 B). The number of bins is dependent on the frequency of collection, either to main containers or to the refuse collection vehicles, and on whether different kinds of waste are kept separate in connection with salvage schemes.

In schemes where porters are employed, the small kitchen bins can be arranged under sinks, etc., with access through an external wall for removal by the porters. Care must be taken, as with delivery hatches, that access to the flat is impossible during the removal or return of the bin.

### Refuse Chutes

The chutes used in flat blocks can be one of two forms: (a) Separate chutes from each flat to individual dustbins at approximately ground level, and (b) chutes serving a number of flats and delivering to a main container at ground or basement level. The second type is the more commonly used. Chutes should have a minimum diameter of 12in., but are more satisfactory with 15in. or even 18in. diameter, as, with the larger sizes, there is much less chance of stoppages.

The chutes are usually constructed of smoothly-jointed, glazed stoneware drainpipes (*see* B.S. 65), but some types of chutes have been made of vitreous-enamelled metal.

The lower ends of the chutes of the type (a) above discharge into dustbins; these are best planned in a recess (with doors) at a level for easy transfer to lorries or at shoulder-height level from which they may be lifted easily for emptying into the collection vehicle.

The delivery end of the type (b) above sometimes discharges into brick or concrete sumps or chambers, but more frequently into special refuse containers, which are designed for easy removal on to special collecting vehicles; these containers should be housed in specially designed compartments, fitted with doors which open outwards into the open air. The sump method is likely to produce unpleasantness unless kept exceptionally clean and well disinfected.

The compartments for housing the transportable containers should be based on the recommendations of B.S. 1136, which suggests certain sizes, etc. The sizes, etc., required for separate buildings for housing containers, are given in Part 1; these small buildings can well be grouped with fuel and perambulator sheds, always provided that the collectors' vehicle can obtain easy access to the containers.

Fig. 27 shows a similar container storage compartment planned, where the latter is connected with a chute and is within the main flat block. The whole compartment must be constructed of fire-resisting materials and be fitted with hardwood doors or doors with metal facings, against risk of fire arising from hot ashes falling into the storage containers.

The walls of container storage compartments should be lined with a hard, smooth and impervious surface such as glazed tiles or terrazzo. Steps at the entrance should be avoided and if the compartments have to be planned at basement level there should either be vehicular access at that level or ramps with very easy gradients should be planned. A supply of water is essential in each compartment, the floor of which should be laid to fall towards a trapped floor gully to facilitate cleaning.

Chutes must be carried up to the highest floor level with the same diameter throughout, and then continued upwards above any flat roof, etc., with at least 6in. diameter pipes, to form permanent top ventilation to the chute. Some means of spraying water on to the walls of the chute for cleansing purposes should be provided at the upper end of the chute.

The delivery end of the chute, which should be as near vertical as possible, should have a bell-mouthed, hopper fitting which should fit closely to the upper edge of the container placed beneath it; the hopper should be fitted with some sort of sliding shutter which can be closed when the sump is being emptied or the refuse container is being changed.

It is important that the flat-level inlets to the chutes are designed so that kitchen pails, etc., may be emptied into them without undue soiling or damage being caused to the adjacent walls or floors. These inlets are usually of three types: (a) sliding horizontally—which is difficult to use; (b) a pullout hopper type; (c) a lifting hinged type. Whichever is adopted it is important to ensure the close fitting of the means of opening and closing the inlets; they should, ideally, be air-tight.

The inlets may be planned on the half-level landings of staircases, so that they can serve two floors; they are better arranged, however, at every flat level or at maisonette lower floor levels. The placing of the chutes and inlets varies according to the type of plan adopted for the flat block and according to whether or not balcony access is used. In all cases, inlets must be placed in the open air.

Where balcony access is used the inlets should be near the staircases and lifts, particularly the latter; in this way a number of flats on the same level can conveniently use a single chute. An alternative is to plan them in conjunction with the individual drying balconies of flats, a position which is usually in close proximity to the kitchen; this arrangement generally means that a single chute can be planned to serve, at the most, two flats at each level.

Fig. 28 illustrates a number of typical positions for chutes and inlets in blocks of flats with staircase access.

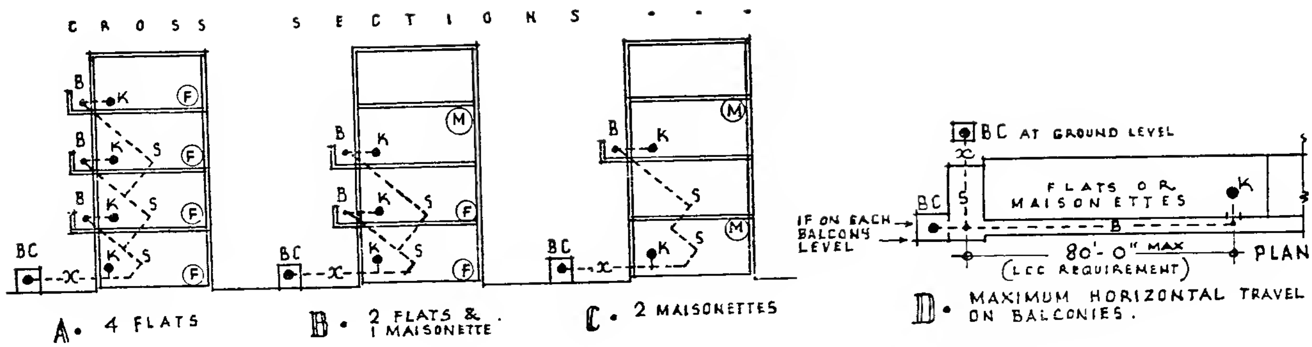



Fig. 25 Comparative handling distances for four-storey flats

KEY

C—chute
I—inlet
B—balcony
M—meter cupboard
BC — bulk-storage container
S—staircase
K—kitchen
F—flat
M—maisonette
x—distance dependent on site layout

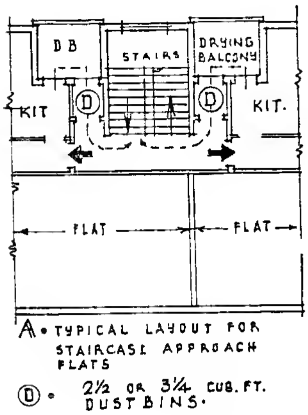
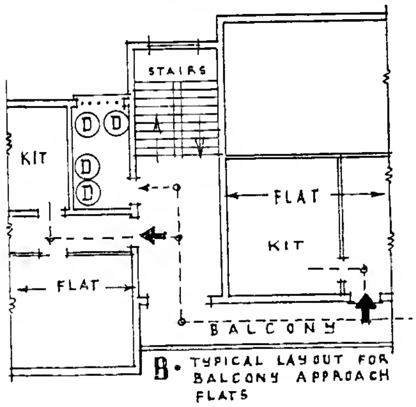



Fig. 26 Dustbins on each storey



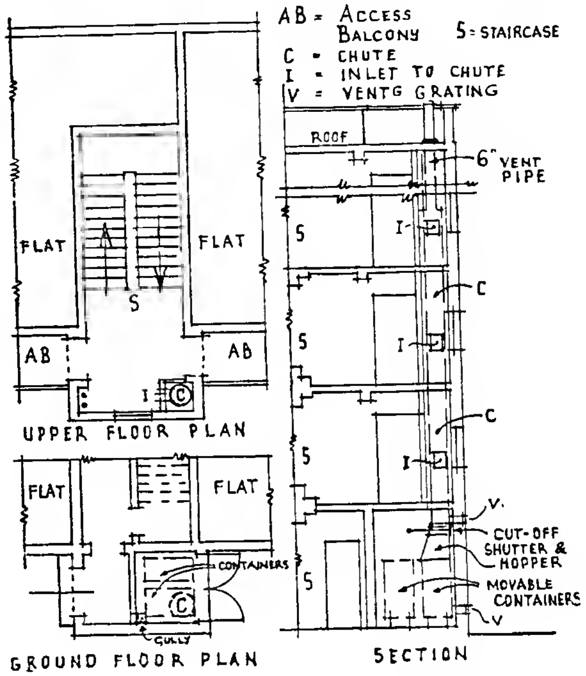
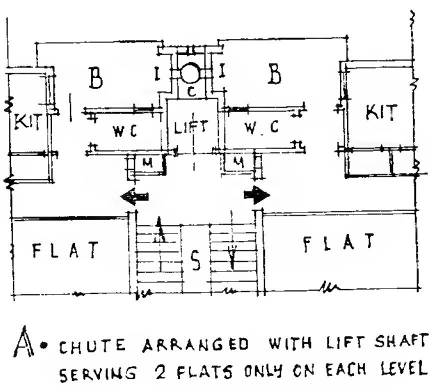
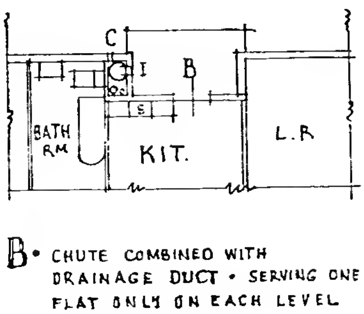




Fig. 27 Typical chute



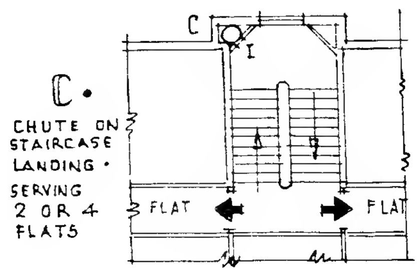




Fig. 28 Chutes in staircase-approach flats

## BALCONIES, ROOF GARDENS, SERVICES, EQUIPMENT

### Balconies

Balconies as approaches to flats have already been discussed, but balconies provided as features of the elevation or as an addition to the amenities of a given room are sometimes required. It should be noted in this connection that balconies are very seldom used for sitting purposes, especially in urban areas. When used, such balconies should not extend over two or more flats unless adequately cut off from each other. The chief exceptions to this are the balconies on the sunny aspect for children's cots and prams in low-rental types and where balconies are used as alternative escapes in case of fire.

### Roof Gardens

Flat roofs of modern blocks provide an opportunity for the provision of roof gardens, open-air recreational spaces, etc., but smoke-laden air is still the chief drawback of this type of development in crowded urban areas. Roof gardens may become dirty and difficult to maintain, especially where water is introduced as an ornamental feature of the layout.

### Equipment

The type, amount and nature of the greater part of the equipment for flats is dependent on the financial aspect of each particular scheme; there is, however, an increasing tendency to provide more and more equipment each year, both for the purpose of space saving and towards the ultimate reduction in cost of the building; also as an aid to letting and a consequent rise in rental return. Certain types, such as flats letting at very high rentals and very small flats for occupation without domestic assistance are usually very fully equipped; though this is only made possible by the comparatively high rentals in relation to the cubic contents of each flat; high-rental types must therefore be very fully equipped, whereas the requirements of the lower-priced types will, as a general rule, be less complete and somewhat more flexible, although there is a definite tendency to use more equipment for the purpose of saving floor space, thus reducing total building costs.

### Heating

Many tenants now realize that the extra rental cost for partial (background) or full central heating is more than offset by the reduction in cost of additional fuels and also many other conveniences. Heating, when provided, is generally part of a central-heating system for the whole block or scheme. In lower-rental types central heating is often provided only in halls, corridors of individual flats and in public circulations. Few tenants in lower-rental schemes seem prepared at present to pay additional rent for central heating and prefer to have fires, either coal, gas, or electric, meeting the cost of fuel themselves. Central heating is very costly for a cheap scheme if the normal flues for individual fires have to be built as well. Consideration now has to be given in higher-rental types to concealment of radiators either in the form of flush wall types or panel heating or by the provision of radiator casings and grilles. (*See also* page 124.)

### Cooking

Gas or electric cooking now seems generally preferred except in working-class schemes in small urban areas where a hard-fuel range is used for cooking as well as room-heating and water-heating, though in a number of working-class schemes central hot-water systems are now being installed.

### Hot Water

A constant and adequate supply of hot water from a centralized installation is becoming more essential every year and except in some lower-rental and working-class schemes, is becoming a general necessity. Low-rental schemes are sometimes equipped with a separate independent boiler in each flat (fuel space involves extra floor area) and in working-class flats provision is made as already suggested ; small localized boilers are preferred by certain types of tenant and the installation costs, together with the necessary plumbing, may be slightly less in first cost: and such a scheme does not involve the owners in the bother of upkeep, complaints of inadequate service, and employment of stokers as would be required in all schemes except those with gas, electric, or oil-fired boilers.

### Heated Linen Cupboards

When constant hot water is installed a coil should be placed in all linen cupboards. Heating should be from the domestic water supply as the radiator system is usually cut off in summer time.

If constant hot water is not installed, some consideration should be given to the desirability of installing a gas or electrically operated heater for these cupboards. There is a tendency to make linen cupboards, in fact most cupboards, much too small. (*See also* Part 1: Storage.)

### Heated Towel Rails

Whenever hot water is available a heated towel rail should be installed in each bathroom for drying towels and when possible, in kitchens or pantries for drying tea cloths, etc.

### Washing Machines

Gas- or electric-heated washing machines are desirable in most low-rental and working-class flats, unless communal laundries are provided.

Drying-rooms or other facilities of a similar kind should be provided in tenement schemes and individual heated drying cabinets should be provided in low-rental schemes.

### Lighting and Power

Lighting is generally by means of electricity and care is essential in the placing of points which are for use by changing and, as far as the architect is concerned, unknown tenants. There is a tendency in many cheaper schemes to be too economical in the number of points provided, especially plug points, in order to make a total cost reduction on the whole scheme; such reductions in services or equipment are not always comparable to the loss of convenience to tenants; the plugs are wanted for many varying purposes such as reading lamps, clocks, plate warmers, hair-driers, wireless, etc. Gas or electric points for heating are desirable in all

rooms (except in working-class schemes) for use with fires; vacuum cleaning points will also be required in most types when the power available is electricity.

Wiring and tubing for each flat should be accessible within the flat without the necessity of entering another. Meters should also be placed in accessible positions and preferably so that the dials may be read without entering the flats, especially in those flats which may be often unoccupied through the day.

Corridor and staircase lighting should be adequate and controlled with key switches by the porters in high-rental schemes, or by time or remote switches in other types.

### Bells

These should be installed from entrance doors of individual flats of all types except working class (which require knockers) and from main entrances of blocks where porters are not constantly on duty.

In medium- and high-rental schemes bells with proper indicators are required from all rooms to kitchens.

### Refrigeration

There is a growing demand for the installation of refrigerators, and for high- and medium-rental flats they are essential. They are generally installed by the owners but operated by the tenants unless a central plant is used; the former has generally proved more satisfactory. For medium-rental and some of the low-rental types, gas or electric refrigerators are often installed if required and a small extra charge is sometimes added to the rental. Provision should be made for 3cu. ft. size, at least, except in very small dwellings when 1cu. ft. may be sufficient. Equipment which is as silent as possible should be selected.

### Water Softening

In some districts water softening is a necessity for central hot-water systems and must therefore be provided in all better-class schemes. In districts where the necessity to soften water is not very great, installations should only be provided in high-rental types, as the capital and upkeep costs are not justified in cheaper schemes.

### Vacuum Cleaning

Central vacuum-cleaning plants are seldom installed for the use of tenants, although in high-rental types, where public halls and corridors are carpeted, a central system is useful to the owners. It is doubtful, however, if a central system is cheaper than ordinary portable plants. Tenants provide their own apparatus and use the ordinary power points in the rooms.

### Plumbing Fittings

The baths, basins and sinks provided in higher-rental flats are often of inadequate size; the extra cost of the larger sizes is small and the increased convenience and attraction to tenants is fully appreciated. Another important consideration is the provision of large supply pipes for hot and cold water for quick filling of fittings and equally large waste pipes for rapid emptying. The use of one-pipe soil and waste water systems should be extended, or at any rate considered in all large schemes. W.C.s and their flushing systems should be selected for silence in operation and care should be taken to insulate any noise from important rooms.

### Lifts

Lifts are necessary for all high- and medium-rental schemes regardless of the heights of the building and for all other schemes having more than three or at the most four stories. The question of the number of lifts to be installed seldom arises except in corridor-type schemes of small flats where one lift per hundred small flats is generally adequate. In high- and medium-class schemes lifts are generally operated by porters and in other schemes push-button types are usual.

When push-button lifts are installed it is wise to use self-closing gates to overcome the omission by users to close the gates after leaving the car. It is wise also to fit automatic alarm signals to tenant-operated lifts to indicate breakdowns in service by ringing at the caretaker's office. Goods lifts are generally necessary in all but working-class schemes and even low-rental types need lifts capable of carrying large pieces of furniture up to the size of large settees and pianos; hand-lifts should be designed for a load of at least one hundredweight.

The isolation of lift noises by means of adequate insulation of all shafts, doors and motors should be given most particular attention. (*See also* Part I: Circulation.)

### Radio

A number of blocks of flats in this country have been equipped with central radio and radio diffusion installations. It is a matter for consideration in individual circumstances as to whether such forms of service will suit the requirements of the tenants of any particular block of flats, as only a limited choice of programme is available, there is a loss of combined radiogram facilities and, as yet, television is not disseminated in this manner. The alternative is for each tenant to operate his own apparatus, for which built-in aerials and earths should be provided in the manner recommended in C.P. 327.201—Broadcast Reception. Special methods of installation are necessary since serious difficulties may arise from interference due to the structure of the building, its equipment, such as lifts, and other electrically operated machinery.

### Telephones

There are three types of telephone installation to be considered. Firstly, intercommunication between rooms in each flat which is seldom installed except in very high-rental schemes. Secondly, for communication to the porter's box at the main entrance and to the tradesmen's entrances, both of which are desirable for all high- and medium-rental schemes; particularly so that tradesmen calling for orders are not forced to climb many flights of stairs.

The third system is the ordinary Post Office telephone, for which provision should be made in all but the lowest-rental schemes at the time of construction to avoid wiring at later dates, especially externally.

**Carpets**

All better-class flats should have the staircases, entrance halls and corridors covered with carpet for appearance, warmth and quietness.

**Built-in Fitments**

Built-in fitments (excepting bedroom cupboards and kitchen cabinets or dressers) are seldom provided except, possibly, in special flats which are let on a semi-furnished basis. Some tenants do not yet seem to like built-in furniture, not do owners feel inclined to install it with the increased rental charges involved unless they are moderately certain that tenants require such fitments. Even bedroom cupboards are sometimes not wanted, as tenants have suites of furniture including wardrobes for which the rooms have insufficient space if the cupboards remain and they prefer to retain the wardrobes in case they require them at the end of their tenancy. Bookshelves in living-rooms are sometimes provided. In medium- and high-class flats, tenants appreciate built-in bathroom fitments such as soap-dishes, bath grab-rails, toilet-paper holders, a medicine cabinet, mirrors with glass or composition shelves, glass holders, etc.

**Wall Safes**

Small built-in wall safes are appreciated by tenants in high- and medium-rental types for storage of jewellery and important papers.

**Locks**

It is a great convenience to tenants to have all external door locks, such as the entrance doors to the block, individual flat entrance doors and garage doors controlled by one master key to save carrying several keys. The head porter or owner should have a master key opening all individual flat entrance doors for emergency purposes.

**Postal Chutes**

So far chutes have not yet been extensively installed although they are convenient in high-rental schemes.

**Laundries and Drying-Rooms**

In the past it has not been usual to provide laundry facilities in higher-rental flats but there appears to be an increasing demand for space and power for the installation of a washing machine provided by the tenant; such space should be provided either in the kitchen or in a utility room. The space requirement varies considerably according to the type of machine selected. In addition to the washing machine special laundry-tubs (B.S. 1229) and a drying-cupboard heated by gas or electricity are often provided; drying cupboards should be not less than 1ft. 6in. wide by 1ft. 9in. deep.

In medium- or lower-rental flats provision should be made for at least a wash boiler (B.S. 1250 and 1326) and a wringer or a washing machine, to which should be added a drying-cupboard ventilated into the outside air and heated from the base; in these types of flat the normal kitchen sink and draining boards are usually used for washing, as space seldom allows special sinks or tubs to be used solely for laundry purposes.

Facilities for ironing are also necessary mainly in the form of conveniently placed gas or electric points and, where possible, ironing boards.

In the lowest-rental types laundry facilities may take one of two forms; firstly the normal sink, wash boiler and wringer as has been described for houses, preferably with the addition of drying-cupboards or drying-rooms since space is often not available, especially in urban schemes, for outdoor drying; secondly, a communal laundry. The latter is generally placed in the basement or on the ground floor and close to a boiler-room as the heat demands are considerable. Opinions vary considerably as to the popularity of communal laundries; the need to look after young children while laundry work is in progress militates against the use of the laundries, but this may frequently be overcome by the planning of a crèche or at least a children's room, adjoining the laundry. It seems, however, likely that the popularity of the communal laundry may be greatly increased by the provision of power-operated washing machines which eliminate, to a large measure, the labour of washing and the cost of such machines is likely to be considered too great for installation in individual flats.

The important factors in planning communal laundries are the provision of reasonable privacy for each user with facilities to make the completion of the work as rapid as possible.

It is usual to provide separate cubicles at least 7ft. 6in. by 5ft., each equipped with a washing machine and a laundry tub or pair of tubs, supplied with hot and cold water; if washing machines are not installed a wash boiler and a wringer are required. In some schemes rotary washing machines and hydro-extractors are installed. Cubicles or machines are usually installed at the rate of one per 20 dwellings and the use spread, by means of a rota, over four or even five days of each week. It is normal to install slot meters to control the fuel used in each cubicle or machine so that each user may consume as much or as little power as is desired.

While ironing facilities are sometimes provided in communal laundries, it is more general to carry out this work in the flats.

It is important that smooth impervious surfaces be provided for walls and ceilings of laundries and drying-rooms to facilitate cleaning; partitions are best kept 6in. clear of the floor and only 6ft. 6in. high from the floor to the top, to permit of free circulation of air. All floors should be impervious to water and laid to fall to drainage channels. Special attention must be paid to ventilation to remove condensation and also to the installation of services and drainage.

Drying facilities for laundry work, whether it is carried out in a communal laundry or in the individual flats, need special provision. Clothes lines on posts are often placed in courtyards but covered spaces are less unsightly and much cleaner in urban areas. These spaces may be merely well-ventilated, enclosed spaces or they may take the form of heated drying-rooms.

In both types solid floors of impervious material are needed: they should be laid with falls to gullies. Unheated drying-spaces are often provided on the topmost floor or in the roof space of pitched roofs. The enclosing walls should consist in the main of louvred ventilators.

Open drying-areas on flat roofs without cover or enclosure are not very satisfactory due to the air-borne dirt of urban areas and to the close proximity of flues.

Drying may take the form of single-family drying-cupboards in or near the laundry cubicles or alternatively large drying-rooms; these drying-rooms are usually planned on ground floors or in basements adjoining or near boiler rooms; they are usually equipped with drying-horses over which hot air is circulated by power-driven fans. Drying-horses are needed at a rate of two for each laundry cubicle. The mechanical plant should be installed in a room to which tenants have no access and separate from the drying-room.

An alternative method of drying is by means of hot pipes below drying-horses but this is a slower system and consequently more horses and more space per tenant is required. Another method of drying laundry is to install power-driven rotary driers at a rate of about one to every three washing cubicles. Such machines do not, of course, replace drying-rooms in those schemes in which the laundering is normally carried out in the flats.

In order to provide drying facilities for day-to-day washing, each flat should be provided with an overhead pulley-operated rack in each kitchen unless small drying-cupboards can be installed in each flat.

TABLE SHOWING SERVICES AND EQUIPMENT REQUIRED IN VARIOUS TYPES OF FLATS

| Services and Equipment | Special small and one room | Working class | Low | Medium low | Medium high | High |
|---|---|---|---|---|---|---|
| Central heating, all rooms | S | S | S | D | E | E |
| ,, ,, partial | S | D | D | E | — | — |
| Some open fires | S | S | S | S | S | S |
| Some gas or electric fires | D | S | D | E | E | E |
| Radiators, cased or concealed | — | — | — | — | D | E |
| Constant hot water | D | S | S | E | E | E |
| Heated linen cupboard | — | S | S | E | E | E |
| Hot towel rail—Bath | S | S | D | E | E | E |
| ,, ,, ,, —Kitchen | — | — | — | — | D | E |
| Wash-boilers | — | E* | E† | E† | E† | E† |
| Water softening | — | — | — | — | S | S |
| Vacuum cleaning, central | — | — | — | — | S | E |
| Refrigerator | S | — | M | D | E | E |
| Phones: between rooms | — | — | — | — | — | D |
| ,, : to entrances | — | — | — | — | D | E |
| ,, : Post Office | M | — | M | E | E | E |
| Post chutes | — | — | — | — | D | D |
| Bells: from entrance | D | S | E | E | E | E |
| ,, between rooms | — | — | — | S | E | E |
| Stores, basement | S | S | S | D | D | E |
| Pram stores | — | E | E | D | — | — |
| Garages | — | — | M | S | S | S |
| Balconies (not access) | S | E | S | — | — | — |
| Stairs, etc., carpets | — | — | — | D | E | E |
| Built-in safes | — | — | — | — | S | E |
| Bookshelves | D | — | — | D | S | S |
| Bedroom cupboards | E | E | E | D | S | S |
| Kitchen dresser | E | E | E | E | E | E |
| ,, broom cupboard | S | E | E | S | D | E |
| ,, ironing board | S | D | E | — | — | — |
| ,, drying cupboard | — | S | M | S | — | — |
| Drying-rooms | — | E | S | — | — | — |
| Bathroom cupboard | — | — | — | S | E | E |
| ,, built-in fittings | S | — | — | S | D | E |
| Servants' rooms (separate lettings) | — | — | — | — | — | S |
| Guests' lettable bedrooms | S | — | — | — | — | S |

E = Essential.
D = Desirable.
* If no communal laundry available.
S = Sometimes installed.
M = May be required by some tenants
† Or space for washing machine.

# SMALL FLATS

### Introduction

There has been an increase in the demand for small flats in recent years; this demand is not confined to any particular section of the community or to any special section of rental prices. Small flats are required equally by comparatively low-paid persons and by the richer elements of the community including childless couples, single persons both young and old. The main differences between the flats provided for different classes are site position, size of rooms and, above all, the amount and quality of equipment.

### The Plan Units

The chief units of small flat plans are the living-room, sleeping accommodation (either as part of the living-room or as a separate unit), cooking facilities, toilet facilities. The table shows the more usual combinations of these units as various types, and should be read in conjunction with Fig. 29 which illustrates some typical plan arrangements of the different types.

Type 1 (*see* table) provides only a living-room; this is also used for sleeping by means of a folding bed and a combined bathroom and W.C. Cooking is a communal service provided by means of a restaurant on a lower floor. This type is closely allied to an hotel or club, but permits of a more personal interest being taken in an individual set of rooms; it is also especially suited to single men and women who are away during the day-time at work and, therefore, do not wish to cook for themselves.

Type 2 is somewhat similar to Type 1, but it has a combined kitchen and bathroom and a separate W.C.; in some cases the W.C. has been placed on a balcony to which two flats have access, and one W.C. is therefore shared by the two flats.

Types 3 and 4 are similar to Type 2, but in the case of Type 3 there is a bed recess instead of the folding bed, and in Type 4 there is a separate bedroom. Types 2 and 3 are suitable for single persons who are at home for only small parts of the day, but Type 4 is satisfactory for a married couple due to the separation of the living-room and bedroom.

Types 5 and 6 both have living-rooms with folding beds and a combined bathroom and W.C., but in the one case there is a kitchen recess and in the other a separate kitchen; the latter is undoubtedly a better type and commands higher rentals.

An extension of these types is the formation of a dressing recess in which the folding bed is placed in the daytime and it also serves as a large wardrobe and dressing space; this system has been widely used for very many years in America, where the small flat has been so extensively developed.

Types 7 and 8 are similar to Types 5 and 6, but have bed recesses instead of folding beds: if the folding beds are properly arranged—especially with a dressing space—they are preferable to the bed recess types.

Types 9, 10 and 11 are more elaborate and are those usually applied to small flats where the district and surroundings permit of higher-grade rentals; especially is this so in the case of Type 11 which may, by the provision of rooms of large floor areas and elaborate equipment, form the highest-class type of small high-rental flats, especially if service is provided in addition. In this flat the living-room, bedroom, kitchen, bathroom and W.C. are all separate.

The various plan types shown on Fig. 29 illustrate a number of those discussed above, but also show in greater detail the relation of the rooms to one another, lobbies, entrances, external walls, etc. Type A corresponds with Type 5 on the table; the entrance is directly into the living-room and external walls may or may not be provided to light the recess for the kitchen in addition to that required for the bathroom. The kitchen recess may only be deep enough to receive a sink or cooking stove and be divided from the main room by a curtain.

Type B corresponds with Type 7 of the table; it is to a large extent a

TABLE SHOWING THE MORE USUAL COMBINATIONS OF UNITS IN THE VARIOUS TYPES OF FLATS REFERRED TO IN THIS SECTION

| Type (The letters refer to Figure 29) | Living-room | Folding bed | Bed recess | Bedroom separate | Kitchen recess | Kitchen separate | Bath | Bath and W.C. combined | W.C. separate | Combined kitchen and bath |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 .. | * | * | | | | | | * | | |
| 2 .. .. | * | * | | | | | | | * | * |
| 3 .. .. | * | | * | | | | | | * | * |
| 4 (Type C) .. | * | | | * | | | | | * | * |
| 5 (Type A) .. | * | * | | | * | | | * | | |
| 6 .. .. | * | * | | | | * | | * | | |
| 7 (Type B) . | * | | * | | * | | | * | | |
| 8 . .. | * | | * | | | * | | * | | |
| 9 .. .. | * | | * | * | | | | * | | |
| 10 (Types D & E) .. | * | | | * | | * | | * | | |
| 11 .. .. | * | | | * | | | | | * | |

variant of Type A, but has more space and the added advantage and comfort of an entrance lobby and the full separation of the cooking unit.

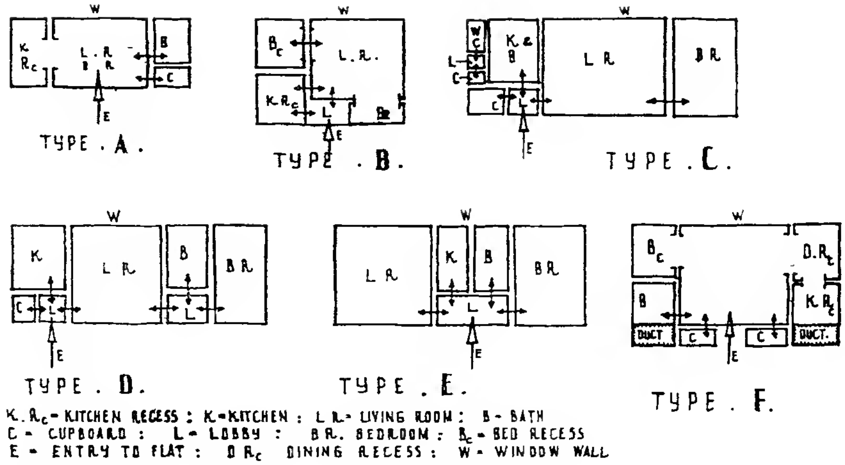
Type C corresponds with Type 4 of the table; the full-size and separate bedroom here appearing on the diagrams for the first time. It will be noted that the W.C. must be cut off from the kitchen (a "habitable room") by a ventilated lobby.

Types D and E provide similar accommodation but in different ways, each having some special points in its favour. Type E has the plumbing and drainage services grouped together owing to the bathroom and kitchen adjoining each other, but one common lobby has to be shared by the entrance and internal circulations, whereas in Type D there is an entrance lobby, also used as a cut-off between the kitchen and living-room and another lobby, used to separate the bedroom and bathroom from the living-room. Type D is, therefore, more suitable for flats where rents are to be higher.

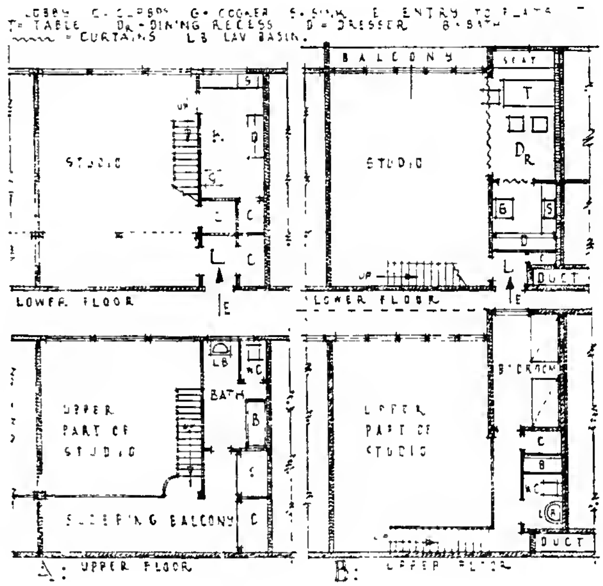
Type F is one of the most common layouts used in American small-flat planning, and is dependent on the fact that artificial ventilation may be used for the kitchen and combined bathroom and W.C. In some areas in this country this ventilation system is now permitted and on analysis it will be found that considerable saving in planning may be made on many sites as the length of external wall required for each flat may be reduced, although the span has to be increased. The basic idea of the planning consists of a living-room which is also used for sleeping by means of folding beds either as divans in the daytime or moved away into bed recesses when not in use; the bed recess also serves as a combined wardrobe and dressing-room. The bathroom and the kitchen are placed on internal walls, which ensures that steam and odours of cooking are drawn away by the mechanical extraction plant near their source and clean air enters these rooms from the living-room; the reverse is apt to happen when windows are used for ventilation.

The space corresponding to the bed recess between the kitchen and the outer wall is used as a small dining-room usually divided from the kitchen by low fixtures, such as china cupboards.

This layout also shows cupboards so placed as to form a sound-screen between the corridor and the living-room, and in addition permits two doors at the entrance to the living-room, thus forming a small lobby.




Above: Fig. 29
Various type plans




Right: Fig. 30
Studio types

Fig. 30 illustrates a type of small flat which does not seem to have been developed in this country. It consists of one large room occupying approximately the normal equivalent of two floors in height, with part of the area of the flat covered by a mezzanine floor. Type A has a large living-room or studio, with a gallery for sleeping purposes placed against the corridor wall. The kitchenette is placed to one side, with the bathroom and W.C. over it; this arrangement of rooms does not require artificial ventilation, as all rooms have windows; the plumbing also is well grouped together for economy. If the approach corridor is eliminated at the mezzanine level, where it is not necessary, the depth of each gallery may be increased by half the width of the corridor.

Type B depends on artificial ventilation for the bathroom, and is therefore only applicable in districts where this system is permitted. The advantage of this type is the possibility of having a separate bedroom if desired, as it can have a window at the upper level.

The kitchenette may also be attached to the ventilating system serving the bathroom, in order to remove cooking smells, which may otherwise reach the main room. The primary use of these types is as studios, but they have been very popular for living purposes in other countries, especially America.

## SMALL FLATS

### Sites

In many instances the sites chosen for small flats, especially in the high-rental groups, are small and rather confined in area, being situated in districts where land values are very high, therefore they do not permit ideal arrangement, especially in regard to aspect of rooms. Sites fronting on to busy streets, particularly those carrying much night traffic, should be avoided if possible for very small types of flats, as it is often impossible to plan the living-rooms, which also serve as bedrooms, in quiet positions; this is detrimental to their letting value. However, in less crowded districts, where sites are less costly, consideration should be given to the aspect; large blocks should be placed with their main axis orientated north and south, if the flats are planned on a central corridor system, so that all flats may have sunshine during part of the day; if the axis is placed east and west the sun is excluded from those flats facing towards the north.

The relative merits of each aspect may be compared in Fig. 31, Diagrams A and B. All the flats in Diagram A have sun for part of the day, and the sunless north aspect need not have any windows except for staircases.

Diagrams C and D in Fig. 31 show how the difficulties of aspect may be treated in courtyard-type plans. Diagram C shows the better layout, larger flats being planned on the east and west axis so that the one-room flats are in positions which obtain sun at some time during the day. The dark corners may be used for staircases and larger flats; the larger flats having north and south aspects, have sun in some rooms, and also have the through ventilation which is desirable for flats of more than one room. Diagram D shows a scheme entirely of one-room flats, in which the few which have north aspects only are lettable for studio purposes.

### General Block Plan

Small flats may be planned on one of two systems of circulation, either approached directly from small staircase halls or from corridors with few staircases; the latter system is probably the most economical, as the cost of additional staircases and especially of lifts, if the latter are required, more than offsets the cost of the increase in the cubic content of the building involved by the use of corridors.

Balcony approaches are not very desirable for small-flat schemes, unless the block is only the span of one flat, which is probably an uneconomical layout.

The objection to balcony approaches in such flats is the necessity of passing by living-room windows and also the overshadowing of the only windows to the flats by the balconies of the floor level above.

A further objection to balcony-type flats is that the flats are placed back to back and the advantages of the sound insulation qualities of the corridors are lost. Balcony approaches are, on the whole, rather dismal and dreary and quite unsuitable for small flats and for better class tenants and if used on each side of a block are apt to be costly, owing to the duplication of approaches.

A further objection to the back to back scheme is the inability to obtain through ventilation, which is to some extent available by means of the corridor system.

The general analysis of site planning for flats, together with general circulation, has already been discussed above, and a considerable amount of the information given is equally applicable to the planning of small flats.

### Service Facilities

Separate service entrances are seldom provided to small flats themselves, but in those blocks in which the flats command high rentals, service staircases and lifts should be provided, so that tradesmen and deliveries do not have to use the ordinary passenger lifts and the carpeted staircases, although they have to use the same corridors as the tenants and their visitors. When service staircases are provided, separate service entrances to the blocks should be planned.

If food is to be served in individual flats from a central kitchen, service lifts should deliver, if possible, into small service rooms on each floor; also, in higher-rental types, if space will allow, an entrance from the corridor directly into the kitchenettes of each flat should be provided, so that the kitchenette becomes a service pantry.

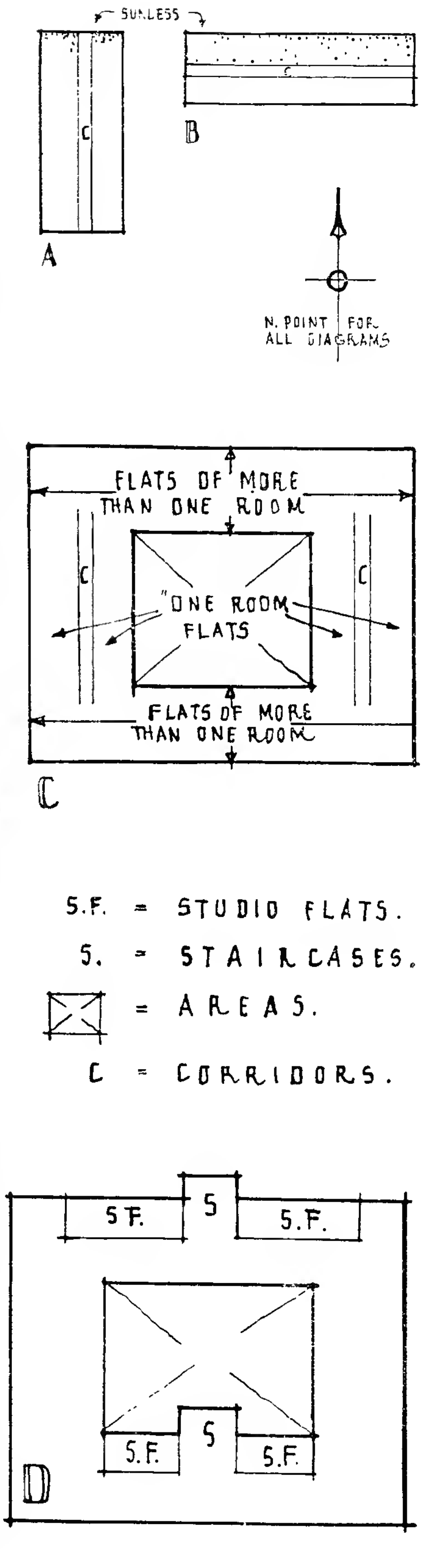



Fig. 31 Aspect considerations

### Corridors

In schemes where corridor circulation is adopted staircases should be placed so that escape from the entrance door to any flat may be in one of two directions; this generally seems to work out most satisfactorily when staircases are placed at each end of the corridors, or, in the case of a block planned round a courtyard, either at the corners, or, better still, at the centre of two opposite sides on the sunless aspect; in some districts regulations may require that no entrance door to an individual flat be more than 80ft. from a staircase, but sometimes dual methods of escape are not required where the total number of occupants of the block is small and the height of the building does not exceed about four storeys.

Corridors should not be less than 3ft. 6in. wide, even when one or two flats are to be served, but in all other cases 4ft. should be considered to be the minimum; if the corridors are long and many flats are approached from them, then much greater width is desirable. In all types corridors should have finishings to reduce noise to a minimum and in all higher-rental types carpets are essential. Similar provisions should be made for the lifts, especially as regards silent operating when they adjoin flats.

### Sub-rentals

On many sites the flats only yield part of the total rental income of a scheme, as in schemes of large flats the street-level floor may be useful for shops. This has already been discussed in this section. In small-flat schemes there are openings for special shopkeepers dealing in goods such as cooked food, hairdressing, tobacco, stationery, or running small restaurants. These shops may be leased out separately, or run by the proprietary company, especially in the case of restaurants; it is doubtful, however, whether, except where very large flat schemes are concerned, the trade produced by the tenants of the flats alone will be sufficient to produce a satisfactory turnover, unless other trade can be counted upon. In medium- and higher-rental types of small flats a few rooms may be required for the personal servants of tenants, together with a sitting-room and in some cases a dining-room; when provided such rooms should be divided into two groups for men and women respectively and should be large enough to be used as bed-sitting-rooms.

When flat schemes are outside the central area of towns and sufficient land is available, garage facilities should be provided, the amount of accommodation being in the main proportionate to the rentals of the flats. A great attraction to tenants of the small flat and one which provides additional revenue, is the installation of swimming baths, squash-rackets courts and tennis courts.

### Fitted Furniture

There has been a very great increase in the use of fitted or built-in furniture in recent years, especially for small flats, and this is undoubtedly one of the most important economies in space saving which can be made.

It is, however, doubtful whether built-in furniture appeals greatly to landlords owing to their being responsible for wear and tear, and to the fact that tenants take less interest in the care of landlords' fixtures than they would in the care of their own property. Also there is still a large number of prospective tenants who own furniture which they wish to use and which cannot be put into the rooms in addition to the built-in furniture. However, there seems to be a number of tenants who are prepared to rent semi-furnished flats and who are willing to pay an increase over the non-furnished flat rental. This makes a handsome return on the money invested in furniture and fitments, after allowing for ample depreciation. Built-in fitments and furniture should be simple in design, well made and solidly constructed, in order, in the first place, to be usable with other furniture the tenants may bring with them, and secondly, to reduce wear and tear as much as possible.

Cheap and poorly made fitments although they are economical in first cost cause annoyance and discontent among tenants and are in the long run very costly.

The fitments should be carefully designed for their individual purposes and should be sufficiently large but not so large so as to reduce unnecessarily the floor space.

### Balconies

In urban and semi-urban schemes private balconies other than those which may be needed for W.C.s as previously suggested, or for access to flats, are attractive features. They should be separate from any balconies used as approaches to the flats and are preferable if reached from living-rooms and bedrooms by means of french windows. Although a small balcony attached to the kitchens is useful for storage of dustbins, fuel bins, etc., it is apt to cause untidiness.

### Communal and Service Rooms

There are certain rooms which must be provided in all schemes of small flats, such as cleaners' rooms, but in addition consideration may be given to the possibility of the installation of rooms for the joint use by tenants such as laundries, lounges and restaurants. Laundries have not proved very popular in this country although this does not seem to have been the case abroad. Lounges do not seem very necessary or likely to be greatly used, although when the flats are very small some tenants may feel that they prefer to meet visitors in a room of more ample dimensions than their own sitting-rooms, especially if the lounge is attached to a restaurant. Restaurants do not seem to have proved profitable to the operators (except in blocks of high-rental flats), unless they can depend on a reasonable amount of trade from outside the building or unless the building itself is very large and consequently has a large population of its own. Tenants of the lower rental types appear to prefer flats with cooking facilities rather than those mainly dependent on a communal restaurant.

### Service Flats

The notes given in this section apply in general to service flats as far as accommodation in the individual flats is concerned, while the kitchens are similar to those for hotels and restaurants. The food in some is consumed in a restaurant or common dining-room, but more generally in the individual flats. In this case the flat kitchen may be eliminated altogether or used as a service pantry either by

direct lift communication with the kitchen, or by a door leading to a corridor in which is a service room communicating with the kitchen.

In the past central kitchens for service flats have been placed on the topmost floors, but with efficient lifts and good basement ventilation to eliminate smells, the top floor is of much greater value for residential purposes: while the basement, which is useless for flats, may well be occupied by the kitchen and its services.

### Room Sizes

It is impossible to lay down specific sizes for the rooms required in these types of flat, as the dimensions are to a very great extent dependent on the anticipated rental value, which again is largely governed by the placing of the site. Flats commanding higher rentals due to their locality generally require larger rooms. Owing, however, to the high value of the site this increase cannot always be given. Another factor is that tenants occupying the high-rental type need a greater amount of furniture, either fixed or movable, together with extra equipment, which again necessitates more room.

### Plan Details

The efficiency of the small-flat plan depends almost entirely on the economy of space which can be obtained by elaborating fitments and the complete designing of all details, based on the minimum space required for each operation or piece of equipment.

### Living-room

The living-room in the smallest types has to serve also as the bedroom and kitchen, and must therefore be so planned that when used for each separate purpose the elements concerned in the other purposes are as unobtrusive as possible; they must at the same time be well placed in relation to windows, doors, artificial lighting and heating. The entrance to the room from the corridor should be screened from the room, if possible, as shown in Fig. 32, Diagram A, or have double doors as in Diagram B; the former layout is better, as the latter is

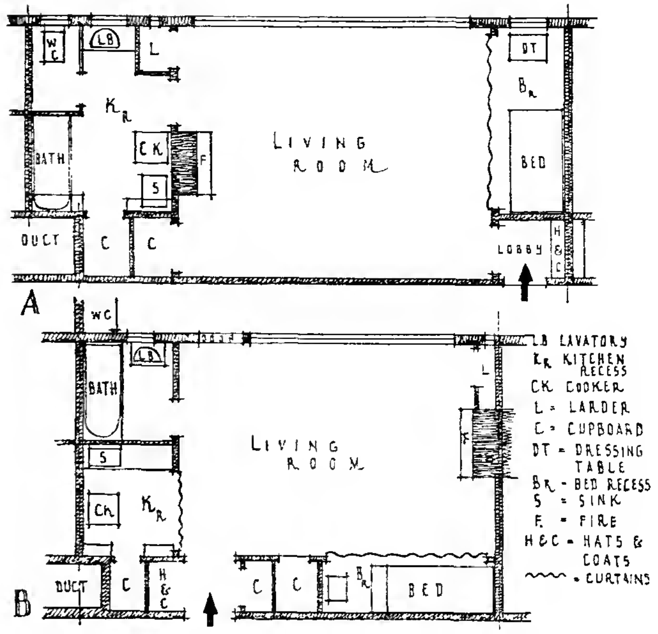



Fig. 32 Typical one-room plans

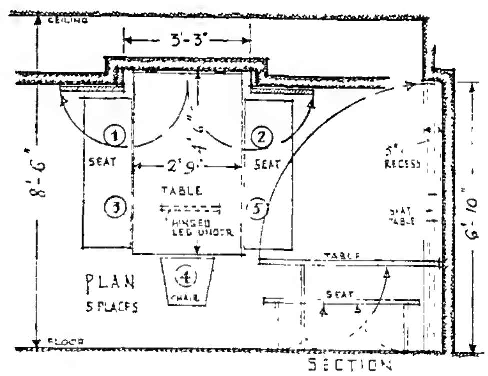



Fig. 33 Typical folding table, etc. for use in small flats

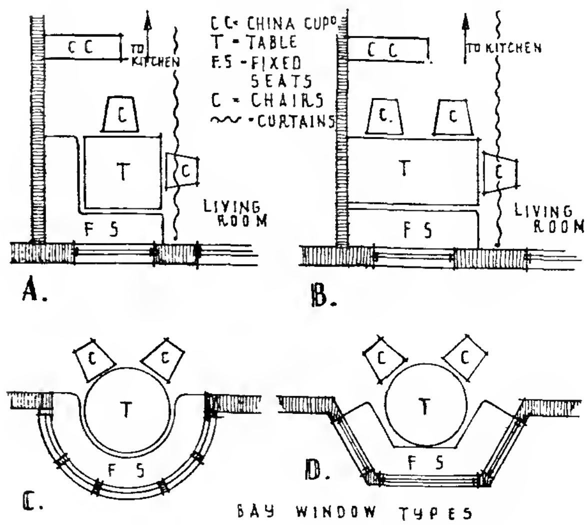



Fig. 34 The dining-recess

apt to be somewhat cramped. The entrance lobby formed by the double doors helps to reduce corridor noise. The bed may be a divan which is used as a settee in the daytime, placed in the room as a piece of loose furniture, or it may be an ordinary bed placed in or built into a recess as shown in both diagrams. When recesses are used they should be placed behind the entrance door and shielded from it to avoid draughts between windows and doors. In many instances the bed recess is divided from the main room by a curtain thus leaving a rectangular room for daytime use. The heating of the room is an important consideration. A fire of some sort is generally needed with the addition, in most types, of central heating, the radiators for which are placed under the windows. As the flats are generally not in use all day, except occasionally at week-ends, gas or electric fires are usually installed; this means less work for the tenants and does away with the necessity of providing fuel-storage space.

Two of the smallest types of one-room flat are illustrated in Fig. 32. Type B has the fault that the W.C. is not placed within the flat, but on a balcony with external approach. This system has been extended so that two flats share one W.C. placed on a balcony approached from both, an economy which does not seem desirable. A smaller type than that shown in Diagram B may be designed by combining the bathroom and kitchen and by separating the combined room from the living-room by a door, the W.C. again being placed on a balcony.

A difficult problem frequently arises in regard to the placing of the larder which has to be externally ventilated. The diagrams illustrate two different positions, but in both there is the likelihood of the external wall having a westerly and therefore hot aspect. Windows are not generally used for larders of this type, the ventilation being provided by two air bricks. The larder of this type of flat may be very small and is only in the nature of a fair-sized cupboard, which generally acts for other storage purposes as well.

On congested sites the long dimension of the living-room may have to be turned the other way to that shown in Fig. 32. Such a layout is not an advantage from the tenant's viewpoint, as the back part of the room is less well lit by the window.

The layout adopted in Type A for the kitchen and bathroom provides a combined room, which forms a ventilated lobby between the W.C. and living-room. Also, if a flap top is provided over the bath a useful table is added in the kitchen which cannot be provided in a congested recess as in Type B. Two further good points in Type A are, firstly, that the kitchen has better light than can be obtained in a recess shielded from windows as in Type B and, secondly, that this type permits of a greater amount of wall space against which furniture may be placed.

In both examples the bed recesses have been made large enough to take a dressing-table in addition to the bed. This eliminates the necessity of putting away those things usually standing on it, which is desirable if the dressing-table has to be in the living-room itself. In Type A it is possible also to provide a window by the dressing-table, which incidentally ventilates the bed recess when the curtains are closed in the daytime.

The minimum size of the living-room itself should be based on a sufficient allowance for at least the following furniture: a small table for meals, two small chairs, one armchair and a writing-desk. Rather more furniture may be necessary, especially in higher-rental types, where additional space is needed for clothes storage, wireless cabinets, pianos, sideboards and various other articles.

Artificial lighting points in the living-room should be provided for a central light, for reading lamps at the desk and fireside and for a bed-head light.

In each example ducts have been indicated for service pipes and plumbing, but no doubt in many examples these might not be used. There is, however, an important point in favour of this provision when one considers how easy the passage of sound from one flat to another is when aided by means of water-service pipes.

### Dining-Recess

In many of these small flats meals have to take place in the only living-room. In this case it may be necessary to use the same table as is used for other purposes, but in some instances a folding table, as illustrated in Fig. 33, may be installed. This fitment consists of a table about 4ft. 6in. long by 2ft. 9in. wide, which is fixed in a recess and folds down into the room from behind a pair of doors. In addition to the table two bench-seats may be included in the fitment. Alternatively a corner of the room may be set aside for dining purposes with a movable table, as shown in Fig. 34, Diagram A, which has a fixed seat against one or two walls for general use and loose chairs on the other sides for occasional use by visitors. This part of the room may be separated from the remainder of the room by a curtain, except during meals. Fig. 34 B shows a similar arrangement of the room but with a fixed table and a fixed seat on one side, with movable chairs for visitors' use on the other side and at the end of the table. Bay windows in living-rooms may also be used as dining-recesses, as shown in Fig. 34, Diagrams C and D. Such layouts save a considerable amount of floor space in the living-rooms themselves, as a fixed window seat constitutes the normal furniture and the table may be pushed into the recess after meals, thus occupying very little space in the main room. It is, however, practically impossible to curtain off these bay windows from the room owing to the resulting loss of light.

### Kitchen

The cooking requirements of the very small flat are generally small and vary considerably, according to rental value. In most types the accommodation may be planned either as a simple recess in the living-room, or it may be in a small separate apartment. As not more than two persons are usually resident in these flats and such occupants frequently have meals away from home, only a very small floor area is necessary, but it must be provided with compactly planned and efficiently fitted equipment.

The items of this equipment need not be numerous, nor need they be other than of minimum size. The essential components consist of a small cooker, a sink and draining-board, with a plate rack over and/or cupboard under, a general storage cupboard for brooms, utensils and dry goods and a larder or refrigerator. In some districts, if a refrigerator is provided a larder is not necessary; but the by-laws in most areas require the provision of a properly ventilated food storage place, which is a factor frequently complicating the planning of the whole flat and one, therefore, which should receive early consideration.

Fig. 35 illustrates two types of kitchenette which are merely recesses in the main living-rooms and separated from them by a curtain. Type A occupies only about half the side of the room, whereas the other type is larger and occupies practically the whole wall. The great difficulty experienced with this type of kitchenette is eliminating entirely or dispersing quickly and efficiently the smell of cooking, which can only be achieved by mechanical extract ventilation near the fittings. Even such a provision is not very satisfactory as mechanical ventilation is frequently too costly to install in schemes for which the range of rentals available permits only flats having this type of kitchen recess. In Type A a combined pipe duct taking wastes and service pipes is indicated with a false ceiling over each recess in which the pipes of the floor above cross from the fittings to the ducts. Type B has a wide but narrow pipe duct which is more suitable when the one-pipe system of plumbing is not used, as the fittings in two kitchenettes are placed back to back, with the pipes immediately behind them. These kitchenette recesses

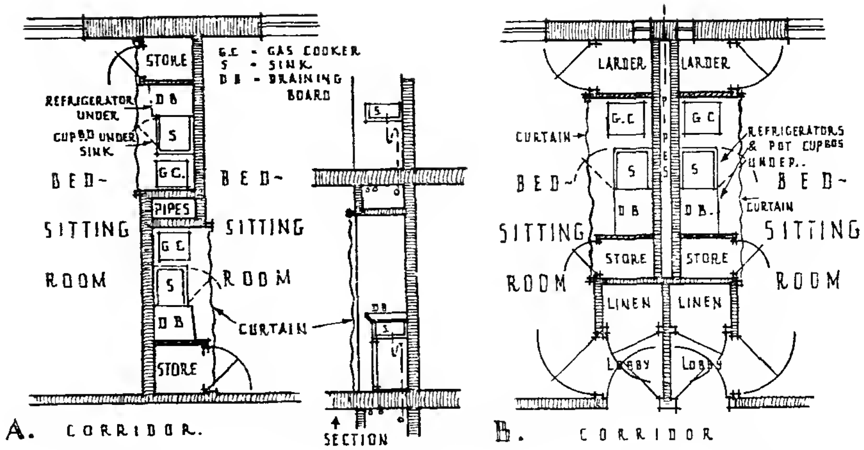



Fig. 35 Kitchen recesses

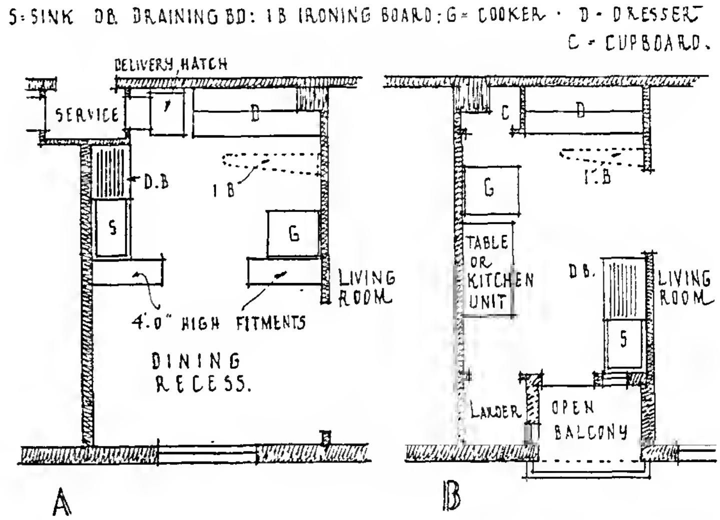



Fig. 36 Kitchen recesses

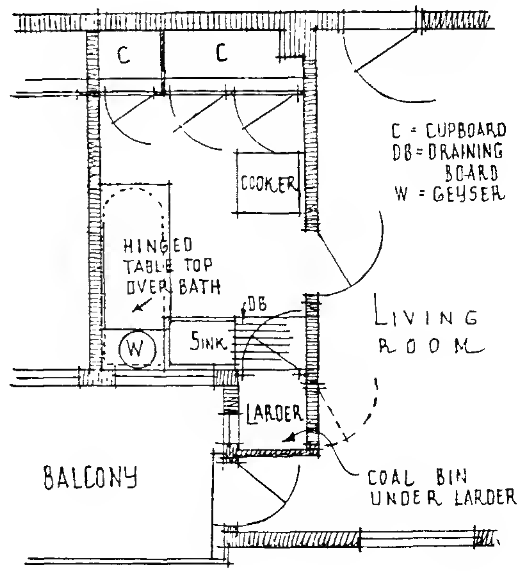



Fig. 37 The bath-kitchen

should be at least 3ft. deep in order to give the fittings plenty of room and also to protect the flooring material of the living-room from damage by splashing of water and grease. The recess itself is most suitably floored with tiles or a similar hard material. The minimum width for a recess should be about 7ft. 6in.

In the larger types of these flats rather more equipment than the barest minimum as suggested above is usually provided. This additional equipment generally consists of more storage space, so that brooms and utensils are kept separate from china, glass and dry goods, a kitchen-cabinet fitting including a working-table surface or sometimes a folding table and a folding ironing-board. Cooking is generally by means of gas or electricity, and hot water is from central sources, although the latter is sometimes not provided in the lowest-rental types. In this case local gas or electric hot-water heaters are necessary. Facilities for home laundry, other than for ironing, are not often provided. The few articles which are likely to be washed at home by a woman tenant do not justify the installation of a copper or washing machine.

Fig. 36 shows two kitchens of larger size than Fig. 35, and which are more thoroughly cut off from the living-room than is the case with the simple recess types. Both of the types shown could, if desired, be shut off from the living-room by a door, although this would reduce somewhat the amount of light available from the living-room windows through the large opening between the rooms.

Type A is based on a type plan used very extensively throughout America, and for really good working depends on artificial ventilation. There is a further drawback in the fact that artificial light is necessary for the greater part of the year in the kitchen section of the room shown. This type combines the dining-recess with the kitchen; separation between the two is by means of low fitments for china. An additional difficulty with this type of plan is the placing of the larder, if it is required by the local authority, a matter which does not arise in America where refrigerators are universally used for food storage, owing to the climate. A special feature of this plan is a patent delivery hatch accessible from the corridor, in which tradesmen may make deliveries in the absence of the tenants of the flats. This fitting has a series of small compartments, the doors to which are locked automatically after the delivery is made and are then emptied from the flat side on the tenant's return. The meters are placed in a compartment under this fitting, so that they are also accessible to the supply companies' inspectors, thus avoiding the necessity of obtaining admission to the interior of the flats. This is a point which should be given consideration in all flats which are likely to be left unoccupied during the daytime. Type B in Fig. 36 shows a kitchen more suitable to conditions prevalent in this country. The dining-recess is omitted and the full depth of the room is devoted to the kitchen itself, although the width of the room is considerably reduced, in fact to a width of about 6ft. This type permits of the provision of a proper larder and an open balcony on which a dust-bin and small clothes line may be placed. This plan gives a floor area which permits of a well-arranged lay-out of fittings and equipment without unnecessary cramping or building of one fitment over another.

Fig. 37 illustrates a kitchen plan in which is incorporated the bath, a type which is only suitable for lower-rental flats mainly occupied by single persons. This plan permits of several economies to be made, such as reductions of area and the convenience of plumbing services for the bath and sink, but necessitates the omission of the lavatory basin, which is probably an undesirable economy. The larder, although more convenient if accessible from the kitchen is probably more hygienic if approached from the living-room, so as to be cut off from the steam and heat of the kitchen. A hinged table-top is placed over the bath for use during the preparation of meals, as the room docs not permit of space being devoted to a table, although one might be incorporated in a kitchen fitment placed where the larger cupboard is indicated. Provision for coal storage, if needed, is made in the lower part of the larder space, often in the form of a movable bin with a separate access door.

## SMALL FLATS

### TYPES OF EQUIPMENT REQUIRED IN SMALL FLATS

| TYPE OF EQUIPMENT | RENTALS Low | Medm | High |
|---|---|---|---|
| Central Heating | S | D | E |
| Open Fire | — | S | D |
| Gas or Electric Fires | E | E | E |
| Constant Hot Water | D | E | E |
| Hot Towel Rail (Bath) | S | D | E |
| Refrigerator | S | D | E |
| Telephone, Post Office | — | S | D |
| Telephone, House | — | — | D |
| Bells at Entrance | S | D | E |
| Wireless, Central Installation | — | S | S |
| Stores: Basement or apart from flat | S | D | E |
| Stairs, etc., soft floor covering | — | D | E |
| Bookshelves, built in | S | D | E |
| Bedroom cupboards | E | E | E |
| Kitchen Dresser | E | E | E |
| Ironing Board | D | D | D |
| Delivery Hatch | D | D | D |

S Sometimes required
D = Desirable
E = Essential

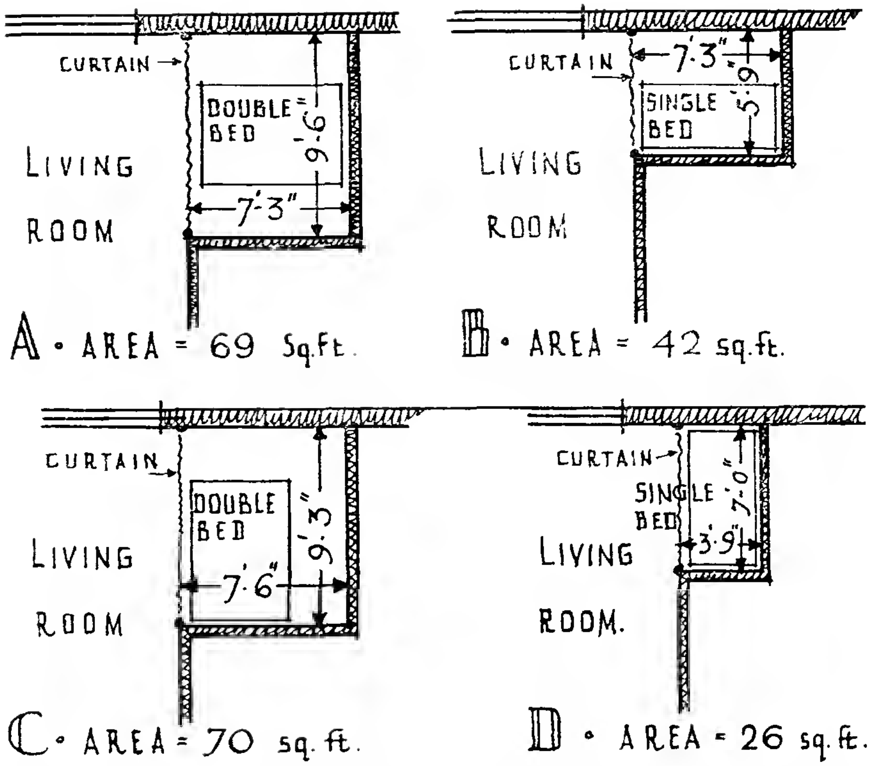



Fig. 38 Minimum sizes of bed recesses for one-room flats (sizes used: double beds —6ft. 6in. × 4ft. 6in.; single beds—6ft. 6in. × 3ft. 0in.)

### Bed Recesses

The bed-sitting-room type of flat exists in nearly all classes, but more especially in the low- and medium-rental types for special purposes, such as the housing of business women and students and they are planned on the same lines as hostels, except that each apartment is self-contained.

One of the most difficult problems in this type of flat is created by the need to provide adequate ventilation for sleeping when a bed recess is used, as one of the most convenient positions for it is generally found to be against the internal corridor wall, thus reducing the frontage occupied by each unit. If, however, the recess can be placed on an outside wall, a window can be given to it.

### Equipment

The equipment of small flats, as regards all mechanical services, should, in general, be more complete than would be provided for larger flats of equivalent rentals. The table given above is a general indication of the equipment usually provided in such flats according to the anticipated type of tenant and the precise rental obtainable for the accommodation in relation to the situation of the site.

Central heating is advantageous to all types, as it eliminates, to a large extent, the use of other methods of heating, except in very cold weather, and always provides a warm building. This is appreciated particularly when the flats are unoccupied through the greater part of the day.

Provision for heating other than by radiators must be provided by some form of gas or electric fire, whichever is the more economical in the individual scheme. Gas or electricity is generally more popular with tenants of small flats, but in high-rental types coal-burning fires may be demanded.

Refrigeration is a normal provision in higher-rental types and is appreciated by tenants in medium types. In some medium-rental schemes a refrigerator is leased at an extra rental to those tenants willing to pay the increased rent.

Most schemes should make provision for post office telephones. A public call-box in the hall under the care of the porter may be adequate for the lower-rental types, but individual instruments will probably be needed in all higher-rental flats.

# Residential Hostels

## INTRODUCTION, LEGISLATION, GENERAL CONSIDERATIONS

### Introduction

For present purposes hostels can be defined as communal living-accommodation. A wide range of users, in varying income groups is, therefore, included. It is not proposed, however, to include certain special types of hostels such as boarding schools or holiday hostels and camps; these are covered in other sections. Types of living-accommodation which are in fact one- or two-room flats, each with separate cooking facilities, forming self-contained dwellings, have also been considered elsewhere.

There is an ever-increasing demand for hostels; mostly they are needed for the unmarried or the widowed of all ages and almost all incomes, for old people and, in special circumstances, for children.

The main groups are:

(1) Common lodging-houses for lowest income-groups.
(2) Hostels for low income-groups.
(3) Hostels attached to shops and works, mainly for lower income-groups but sometimes for others.
(4) Local-authority and independent hostels, e.g., Y.M.C.A., mainly for students and low income-groups.
(5) Independent hostels for middle income-groups.
(6) Independent hostels for higher income-groups.
(7) Hostels for special types of workers, e.g., police, railwaymen, agricultural workers and mobile labour forces.
(8) Hostels attached to teaching institutions, e.g., university colleges and halls of residence.
(9) Hostels for old people.
(10) Hostels for children.

### Legislation

The principal legislation affecting hostel design and construction, apart from normal by-laws or building regulations, is the Housing Acts of 1936 and 1949, the Public Health Act, 1936, and the Children's Act, 1948.

The Housing Act, 1936, through the operation of Section 57 and its Fifth Schedule, controls the possibility of overcrowding by laying down minimum areas and distribution of sleeping accommodation.

The Housing Act, 1949 (in Section 10) amends Section 6 of the 1936 Act so as to restore to local authorities the power to make by-laws for regulating the number of persons in houses let as lodgings or occupied by members of more than one family—which may be assumed to include hostels. Section 40 of the 1949 Act provides for national Exchequer assistance to local authorities towards the provision of " hostels "; the expression " hostel " is defined as " a building wherein is provided, for persons generally or for any class or classes of persons, residential accommodation otherwise than in separate or self-contained sets of premises." Old people requiring " care and attention " are, however, specially covered by Section 21 of the National Assistance Act, 1948.

The Housing Act, 1936, in Section 72, gave power to local authorities to provide " housing " for the " working classes." " Housing " may be assumed to cover hostels but " working classes " is not defined or limited to any maximum income.

Part IX of the Public Health Act, 1936, controls all common lodging-houses and provides for administration by local authorities. Section 235 of this Act defines a common lodging-house as " a house (other than a public-assistance institution) provided for the purpose of accommodating by night poor persons, not being members of the same family, who resort thereto and are allowed to occupy one common-room for the purpose of sleeping or eating." The important words " poor persons " are not defined and it might be possible, therefore, to apply any requirements of by-laws made under the act to other types of hostel, and even to cover normal " boarding-houses " occupied by persons of the lower income-groups; this might be most inconvenient to owners of hostels or boarding-houses in districts where the authorities have adopted by-laws based on M.o.H. Model Series III, as these include requirements such as that all walls and ceilings have to be limewashed in the first week of April and October, all floors must be swept every day before 10 a.m., and sufficient towels must be supplied.

The Children's Act, 1948, places an obligation on local authorities to house and care for children of all ages who may be in need of assistance; thus the authorities have to find accommodation with foster parents or alternatively provide suitable hostel accommodation.

The " Housing Manual, 1949," and " Housing for Special Purposes, 1949 " (H.M.S.O.), have references to hostels and should be consulted.

### Types of Hostel

The first group mentioned above, common lodging-houses, often known as " doss " houses, should not be confused with public-assistance institutions which provide for the destitute. Common lodging-houses are sometimes provided by local authorities, sometimes as private ventures and often by charitable organizations, such as the Salvation Army. The charges made for accommodation are very low and consequently the facilities are minimum.

The second group, being for low-income-group users, is also of a very simple character, providing, however, more privacy with better feeding facilities.

The third group is really a development of the living-accommodation which in the past was provided for the use of the apprentices and unmarried staff over individual shops. Many shops and factories, both in urban and rural areas, find that housing and hostel accommodation must be provided in order to obtain labour. Examples vary greatly in the quality of accommodation as they may have to cater for fairly wide ranges of income from trainees and apprentices upwards. The bulk of users are, however, likely to be within the lower income-groups.

The fourth group caters for the same income-group as the third type but users are drawn from a wider field of employment; although the variation in ability to pay may be less wide. Hostels of this type vary greatly in size from 15 or 20 beds up to several hundreds. It is probable this is the type most needed in all parts of the country and one which might, with advantage, be undertaken by local authorities as part of the housing needs of the country. So far, however, it seems that local authorities take little advantage of powers to provide hostels for clerical and skilled workers.

Groups 5 and 6 are generally similar to Groups 3 and 4 except that better facilities, greater accommodation and greater privacy are provided, with a consequent increase in rents charged.

Separate bedrooms and bed-sitting rooms are generally required in these types, better furnishing and higher-grade dining and other service facilities.

Group 7 includes a wide range of hostels of specialized accommodation in connection with work. The use made of this type may be of a transient nature as, for example, where railwaymen and mobile labour teams are concerned. Few of the users are likely to be highly paid. Hostels for mobile labour are very badly needed in many towns owing to the shortage of lodgings which may be required only for short periods; the users are generally skilled or semi-skilled persons who travel to carry out installations of machinery.

Group 8 is made up of hostels for specialized uses, which are subject to local variations, often arising from traditions. The main feature which makes these hostels different is the demand for more space for quiet study than is needed in normal hostels and the fact that study-bedrooms may be required and be occupied for long periods.

Hostels of all types usually provide accommodation for one sex only or have separate wings for each sex; exceptions are, of course, those for old people and those hostels, occasionally attached to factories or institutions, providing accommodation for married couples. In most hostels occupied by a single sex, facilities are provided for visitors of the opposite sex in rooms on the ground floor, usually near the entrance.

It seems generally popular and desirable that hostels should not be too large, in order to be as homelike as possible and avoid "institutional" character. It is also preferable that they should not be directly attached to individual shops and works, although frequently this is unavoidable. In larger cities and for more isolated establishments individual firms often have to provide staff hostels without which necessary labour cannot be recruited for shops, offices or factories; in some areas, however, the development organization or estate-management company operates hostels of various types which are made available to any employees of firms in the area. Similar hostels may well be needed in some, if not all, of the new towns.

In hostels for women, especially hostels of less expensive types, much domestic work is carried out by the residents assisted by a relatively small staff which attends to the communal accommodation and carries out the catering duties. Among women there is, in fact, a considerable demand for a type of accommodation which is little more than a series of small flats with some communal lounge space; these are hardly hostels and, as border-line types, are excluded.

Hostels for men, on the other hand, usually provide full domestic service covering cleaning, cooking and even clothes-mending, although some less expensive establishments expect guests to make beds and help with service of meals.

Hostels for old people are now needed for almost every income-group. At the moment much of this type of accommodation is being provided by the conversion of large houses. This type often provides for both sexes and married couples in the same building. Two storeys only are usually recommended for this type of hostel, with the numbers of occupants as not less than 25 and not more than 40. Local authorities are providing some hostels of this type but many are operated by charitable organizations or by private ownership, the last particularly for higher income-groups, the accommodation and service facilities being more elaborate than in those provided for old people of the "working classes" under the Housing Acts.

The last group in the above list concerns a hostel development which is likely to increase due to the operation of the Children's Act, 1948. In the past many such hostels have been provided by charitable organizations such as Dr. Barnardo's Homes although some have been local authority institutions. Here, again, at the moment, conversion of existing buildings, especially in rural areas, is likely to precede erection of special buildings.

### Sites

These vary greatly with the particular sort of hostel under consideration; though there are, however, common factors for most sites. Proximity to public transport linking hostel to places of work is of first importance; sometimes, as in rural or semi-rural factory hostels, it is possible to plan the living-accommodation within easy walking-distances. Hostels should be kept away from busy and noisy thoroughfares; this is specially important where users need to sleep during the day, such as policemen, railway workers and night-shift workers.

Traffic access is necessary to service parts of all hostels for delivery of food, fuel and laundry and the collection of refuse but in most types few other traffic access facilities are needed beyond the occasional car or ambulance at main entrances.

Hostels for old people should be reasonably close to shops and to such recreational facilities as cinemas; while others, for children, should have easy access to schools and playing-fields.

When hostels are planned in less crowded areas, it is desirable to include sufficient site area for a garden and for recreation, such as tennis, unless such facilities are already available in the neighbourhood, or at the places of work to which the hostels may be attached.

As most hostels are provided for those of lower income-groups it is important to avoid sites which are expensive, either in first cost or in maintenance or annual outgoings, in order to keep down rents.

Adequate public services such as drainage, water and power are essential, except for a few very special schemes such as those for agricultural and forestry workers in very remote districts. Even then a good water-supply is important.

Sites need not necessarily be level; good use may often be made of falls or half-levels for storage and similar accommodation. Where outdoor recreational facilities are provided, such as tennis, some reasonably level portions of the site are needed to avoid excessive installation costs; terraces attached to the buildings can be a great summer asset.

### Aspect

As hostels are domestic buildings in continuous occupation for all seasons of the year, the aspects given to the various rooms should follow normal domestic allocations; living-rooms and bed-sitting-rooms should have positions receiving some sunlight even during the winter months. Less good aspects may be given up to kitchens, sanitary accommodation and storage. Games rooms may also be given the less sunny aspects, being mainly used during wet weather or in the evenings.

## GENERAL PLANNING, SECTIONS, CIRCULATION

### General Planning

Fig. 1 on page 149 illustrates diagrammatically relationships of usual hostel accommodation.

All rooms for common use should be grouped together and related to the main entrance; dining-rooms should have easy access to kitchens. In close proximity to the entrance should be administrative offices and visitors' accommodation, if the latter is required. It is preferable that common rooms be planned on the ground floor although some may be placed at lower-ground or first-floor levels. The dining-room should be on the same level as the kitchens wherever possible. Sanitary accommodation should be calculated and planned having regard both to the common-room accommodation on the lower floors and the sleeping-rooms on the upper floors.

Except in hostels for old people, and possibly those for children, there need be no height restrictions. When there are more than three storeys, or perhaps four if the users are all young people, lifts should be planned. High buildings must have proper means of alternative escape. Staircases should be enclosed by fire-resisting construction and the partitions which bound connecting corridors should provide a reasonable degree of fire-resistance.

The amount and quality of accommodation and incidental fitments are closely related to the income-group of users and some general notes on usual standards follow.

Hostels of the "common lodging-house" type should be of robust construction with hard-wearing and easily cleaned surface-finishings. Dormitories are usual; in hostels for women the beds are sometimes curtained or otherwise screened to form cubicles. A combined day-room-dining-room is generally provided. Meals are of the plainest type but need to be available over long periods. Sometimes the only cooking facilities provided are those for users to prepare their own meals in a common kitchen, etc. Bathrooms and lavatories are often provided on the ground floor or in a basement and should be planned reasonably near the entrance. Some form of baggage room is required near the entrance, in which users may leave personal property; such a room is usually fitted with lockable metal lockers which can be cleaned out easily and of a size suitable for a small suitcase, haversack or portable bundle. It is essential to provide a sick-room, preferably with its own sanitary accommodation.

In general, the sanitary accommodation should be associated with the day-room accommodation and the main entrance; some W.C.s and lavatory basins, however, are needed on the levels of the sleeping rooms. Facilities for users to wash and dry clothes, etc., are essential and can be grouped with ground-floor bathrooms.

Hostels for lower-paid workers also may be simple in character. Sleeping-accommodation is generally in the form of dormitories or large rooms containing up to six beds; the larger the number sharing a room the more economical can be the accommodation provided: thus the greater the privacy the higher the rent. Cubicles instead of open dormitories are often used; frequently only formed with curtains. The lower-income type of hostel needs some communal facilities in the shape of lounges, quiet rooms and games rooms as the bedrooms generally do not provide sitting- or writing-space; occupants of this type of hostel seem to go out less and to spend leisure time at the hostel. As rentals increase there is not necessarily a corresponding increase in floor areas; the larger part of the difference, except for more privacy in bedrooms, is devoted to better furnishing and meals and more comprehensive service.

The highest rental types may provide each tenant with a suite of two rooms, i.e., a bedroom and a sitting-room and even a private bathroom. Many unmarried or widowed business and professional men and women are willing to pay relatively high rents for what are virtually service flats with meals served in a communal dining-room.

Hostels attached to factories and shops may require considerable variation in the type and quality of accommodation; in such schemes care should be taken to plan the high-priced accommodation where it is not disturbed unduly by noise from common-rooms.

Hostels for old people present quite different problems, the most important of which is that the users do not go out so much or so regularly and spend the greater part of the time in the hostel. Increased room areas are thus essential both for bedrooms and common rooms. Pleasant gardens, easily accessible, are specially important.

Collegiate hostels vary greatly in character and this is often due to local traditions. The majority of recent schemes provide for all meals, except snacks and sometimes teas, to be taken in a common dining-hall, but in a few schemes students are given self-contained suites, sometimes sharing bathrooms and kitchens and only one main meal is eaten communally "in hall." Hostels of this type now tend to provide single study-bedrooms for each student, although rooms for two are sometimes provided.

The common rooms are often smaller and fewer in number than in other types of hostel as more time is spent by students in their own rooms.

### Sections

The planning of small bedroom units over large common rooms may control the form of sections of multi-storeyed hostels or involve a certain amount of heavy structural elements. In Fig. 2, Diagram A shows that if bedrooms are planned on one side only of the corridors on the upper floors, the common rooms, in order to be reasonably wide, must be constructed to carry one of the external walls of the superstructure. If bedrooms are on both sides of the upper part of the wing (Diagram B) the common rooms on the ground floor may be found to be wide enough. Under certain circumstances and with some types of hostel it may be a better plan to place the common rooms in a separate block and to standardize the bedroom accommodation throughout residential wings or blocks including ground floors, a method which, if site-space permits, may lead to considerable economies in building costs.

### Vertical Circulations, etc.

As in flats, approaches to the various levels of accommodation can be in small units (as in Diagram A of Fig. 3) where a staircase serves only two or four apartments in each floor, or a large number of units can obtain access from corridors communicating with staircases or lifts.

In general principle, the minimum distance of any sleeping or similar accommodation from a staircase and the need for the provision of alternative escape in the event of fire, follows the

requirements of flats. Fig. 3 shows various types of approach and escape and indicates the relation of sanitary accommodation to stairs and bedrooms.

### Entrance Halls

These act as the main distributive centres of hostels, from which main circulations, both vertical and horizontal, should lead to all parts of the building. Halls should be ample as they are likely to serve as general waiting-spaces. The administrative office and/or inquiry office of the building should open directly from the hall and any visitor's rooms which may be provided should also lead directly from this central space. The entrance from the street should be provided with a draught lobby to keep the hall at a comfortable temperature. It is desirable for halls to have adequate daylight although this may not always be possible. Ample wall-space is needed for notice boards.

It is normally undesirable in the interests of simple control to have secondary public entrances to hostels. Some special types, however, such as those for workers who return to the hostel in dirty clothes and boots, need a secondary entrance leading directly to changing- or boot-rooms, before passing to the main rooms of the building.

Provision should be made in or near the entrance hall for telephone boxes for the use of residents.

### Administrative Offices

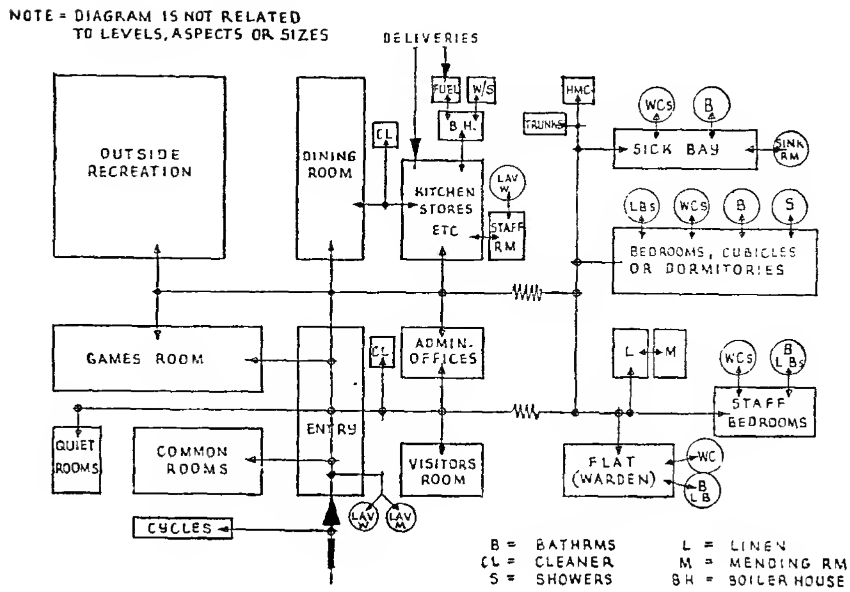
Hostels are generally in the charge of a manager, often called a warden or bursar (or, in women's hostels, a matron), for whom office accommodation is needed in a central position reached easily by residents or visitors and from which general supervision of the main entrance is easy. In some hostels, especially those for students, the warden may have a separate suite, the general office being used only by a clerical staff. In some large hostels, a separate reception office and inquiry counter may be needed, as in an hotel. The office or the inquiry counter, when provided, should be at one side of the entrance hall and have either a counter or hatch. Some hostels have short-stay visitors and consequently the whole entrance-planning can be treated very similarly to that of an hotel. In many hostels the office also serves as a shop for articles such as stamps, cigarettes, etc.

In small hostels, especially in types such as those for old people, the office serves also as the warden's or matron's sitting-room: in such cases a floor area of at least 120sq. ft. is needed. Room keys, in those hostels where they are regularly used, and letters, are usually handled at the office. Convenient space is required for desks, files and usually a safe and, when the office is used for the dual purpose, normal sitting-room furniture.

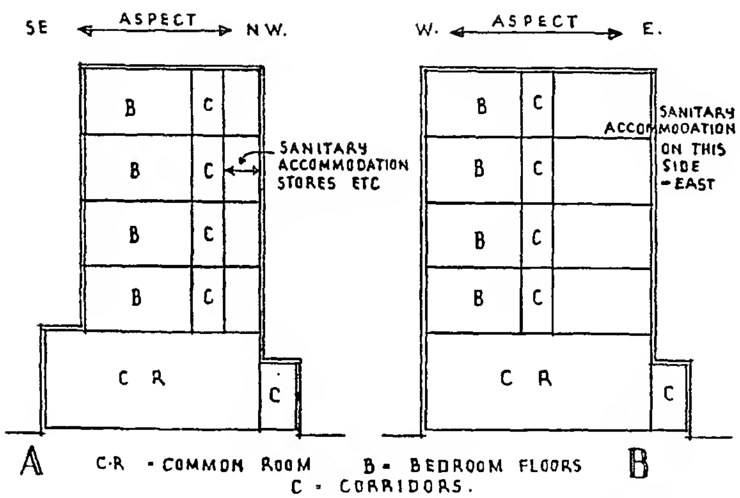
### Visitors' Room

This is usually approached directly from the entrance hall and furnished as a normal sitting-room. It is generally used for the reception of residents' guests of the opposite sex or as a room where visitors may be taken for private and quiet conversation. Such a room is especially necessary where hostels provide only bedroom and dining-room accommodation.

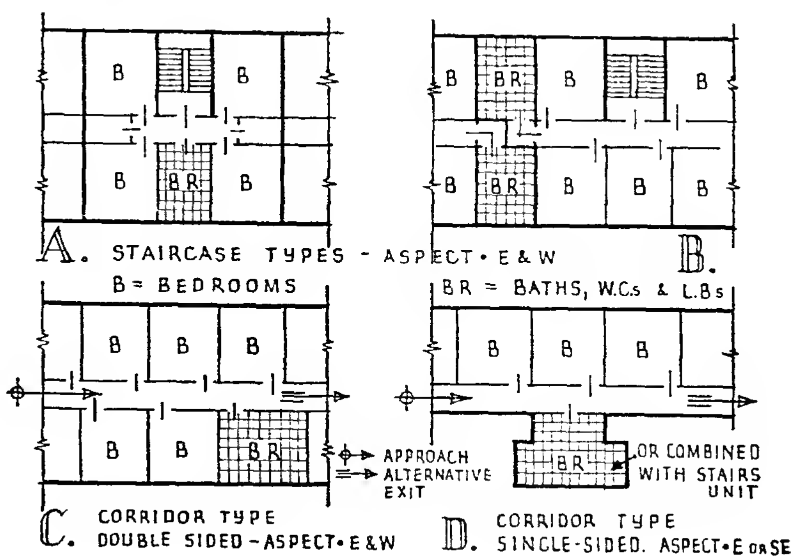
PLAN ANALYSIS, SECTIONS, ADMINISTRATION




Right: Fig. 1 General analysis diagram




Left: Fig. 2 Sections. Multi-floor types




Right: Fig. 3 Types of unit for multi-storeyed hostels

## COMMON ROOMS, LOUNGES, GAMES ROOMS

### Common Rooms

All hostels need common rooms for day and/or evening use by residents, but areas and types may vary considerably. In common lodging-houses and those for very low income-groups a combined lounge-dining-room for each sex may be all that is provided; it may be based on an area of as little as 10sq. ft. per bed. In normal hostels for lower- and middle-income groups, a total area for common rooms, including dining-room, will usually amount to 20sq. ft. per bed as a minimum. If it is desired to seat all the residents for meals at the same time, considerably more may be required. It can be assumed that a proportion of the residents will be out at any one time, except in hostels for old people and children. This may well affect the total space for these communal rooms. In general, smaller hostels need more common-room space per bed than larger ones.

Common-room areas, apart from dining-rooms, should be divided between a number of rooms for particular purposes such as sitting-rooms, quiet rooms and games rooms, the demand for which varies according to the type of resident. Common rooms are normally planned on the ground floor, although lower ground floors and even basements may be used for some purposes such as games rooms. In hostels for old people all rooms should be on the same level to avoid steps and, similarly, in children's hostels supervision is simplified if all the rooms are planned together in a group on one level. Common rooms should have plan shapes suitable for the various uses, be well lighted, and have pleasant aspects and outlooks wherever this is possible.

It is not possible to give a proportional distribution of common-room space between various uses, as this varies according to the situation of site, type of hostel and residents' ages and occupations. (*See* Fig. 4.)

### Lounges

Several small rooms are more useful and better appreciated by users than one large room. Such rooms are more homely and less institutional. It should, however, be possible to throw two or more rooms together for formal or larger social occasions. (*See* Fig. 4.) Common rooms can, therefore, be planned *en suite* with advantage, but every effort should be made to check noise between them when in normal use, either by acoustic treatment or by initial planning.

The common rooms should be varied in shape and size and suitable for furnishing with normal domestic types of easy chairs and occasional tables arranged in groups. A piano is usually required in one room and provision should be made for radio (with different programmes in different rooms) although in some hostels radio is confined to a special room. Some facilities should be provided near the lounges for the storage of part of the furniture when it is necessary to clear the rooms for dances, receptions, etc.

### Quiet Rooms

At least one room should be set aside for reading and writing, except perhaps in hostels with bed-sitting-rooms or study-bedrooms. The position of quiet rooms should ensure the maximum cut-off from other common rooms and particularly any which may be the source of special noise, such as games rooms. Good day- and artificial-lighting is essential.

The rooms are usually furnished with easy chairs and writing tables with suitable chairs.

### Other Common-Room Facilities

Some hostels provide library facilities in the quiet room or provide for the loan of books from the office. In some hostels and especially those attached to teaching-establishments, a properly equipped library may be needed for the storage of books and for study purposes; quite large areas may be needed and the plan should follow the lines given in the sections on "Schools" and "Libraries."

In lower income-group hostels for women a sewing-room is often provided and equipped with facilities such as a cutting-out table, a pressing-table and sewing machines, the latter often being hired by the hour.

Some hostels provide music practice-rooms. These can be small rooms, about 9ft. by 6ft.; they must be well insulated, by acoustic materials or planned isolation, against transmission of sound to other parts of the building.

### Games Rooms

In hostels for older types of residents rooms may be needed for cards, chess and similar games; in those for younger people rooms for more strenuous games, such as table tennis, darts and even squash rackets, are likely to be required. Billiards rooms are sometimes provided. In some large hostels facilities for swimming and physical training are provided. The shapes and areas of the rooms provided must be related to the special uses. In most cases games rooms should be regarded as sources of noise, a factor which should be considered very carefully in planning.

Games rooms are sometimes used for dances and practice dances and should have a flooring material suitable for this use. Except where facilities such as a gymnasium or swimming pool are provided, it is often convenient to plan one large room for use for a variety of games and this method may have the advantage of providing one quite large meeting-room in which a small permanent or temporary stage may be planned.

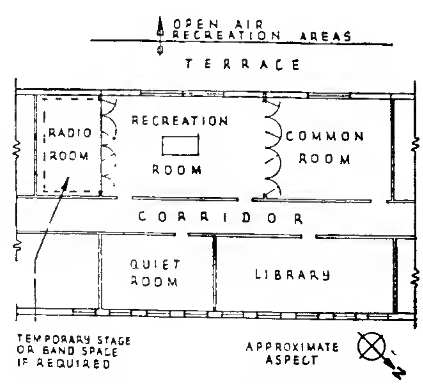



Fig. 4 Layout of common rooms in a hostel

### Food Service

Facilities may vary greatly. Many organizations do not provide mid-day meals for residents but only for staff, except at week-ends. Some hostels, however, such as those for old people, children and those attached to educational organizations have to provide for all meals, including afternoon tea. Certain types, while not providing mid-day meals have to be prepared to issue packed lunches. Many have to provide meals spread over long periods of the day, as residents leave for or arrive from work at varied times of both day and night.

Except in higher-rental types and those for old people and children, self-service is becoming general; this has considerable bearing on the planning of kitchens and serveries as it is then virtually essential that they are planned on the same floor level as the dining-rooms or canteens. The type of meal to be served also greatly affects kitchen layout, but generally hostels have set meals with only a small choice of dishes which simplifies the amount of room and equipment necessary.

In scholastic hostels or halls of residence there is an increasing tendency to provide all meals in a central dining-room, or college hall, although, in some cases, provision is made for students to take dinner and sometimes lunch in a main dining-hall and to provide other light meals or refreshments in their rooms; this arrangement necessitates more elaborate pantries and storage facilities associated with living-accommodation.

### Dining-Rooms

Dining-rooms for students, old people and children may have to seat the whole of the residents at one sitting. In other types meals are spread over longer periods and the dining-room may be smaller as it is used in relays. Generally a floor area of at least 10sq. ft. to 15sq. ft. per person is necessary to permit table space and adequate gangways. This area has to be varied according to the type of table adopted as it will only be adequate if long tables seating eight or ten persons are used. (*See* the section on "Factories.") Tables for two or four persons are generally used in the higher rental types and these will require more space. Detailed information on dining-room seating is given in the sections on "Hotels." The reader is referred to the same sources for various requirements for kitchens, cafeteria service, serveries, etc.

### Occasional Meals

Since hostels must be considered as the homes of residents, some facilities for snacks and tea-making are required in most types.

These may be provided by the normal kitchen and dining-room service in those hostels which find it necessary and possible to provide staff over the long periods involved, but often this is impossible and alternative arrangements have to be made.

Some hostel organizers require small tea-kitchens or pantries near common rooms; others, and these are more general, especially when dealing with bed-sitting-rooms or study-bedrooms, find that tea-pantries are needed on bedroom or residential floors. When plans are based on the use of common staircases serving up to about four sets of rooms per floor, as in the so-called "collegiate" type or halls of residence, one pantry will usually be found sufficient for four storeys (16 rooms).

In most other types, however, one pantry per floor is the minimum needed, and it will be found that a single pantry will serve a large number of rooms in hostels of the corridor type, provided that adequate space and sufficient equipment are provided. In some schemes cleaners' stores and even a residents' laundry may be combined in one group with the pantry and the whole service unit be placed on intermediate floors, more or less equidistant from all bedrooms.

The normal pantry equipment is two or more gas boiling-rings or electric kettles, a small griller, a sink and draining boards and a series of small ventilated lockers in which each resident may keep china and supplies. Two gas-rings will usually suffice for up to twenty persons unless whole meals such as breakfast have to be cooked. Most hostels discourage residents from keeping food, china and similar articles for meals in bedrooms or sitting-rooms.

### Residents' Kitchens, etc.

Where these are required, for example, for single persons and in houses for the elderly, full facilities for communal meals are not provided, but the occupants do their own cooking. This is done by either planning kitchen recesses to bed-sitting rooms as described in the section on "Flats" or else by providing common kitchens to house separately metered small cookers (with high-level small oven and hotplate), etc., for each person as illustrated in Fig. 5. A series of ventilated larder and store cupboards is also needed, one for each person, and space for a number of preparation tables which may be shared by two or three persons.

Several sinks are needed in order to permit several persons to wash up concurrently. It is desirable, in rooms for the able-bodied elderly, that facilities for tea-making should be available in each bed-sitting-room.

### Staff Meals

Wardens, managers and those having special rooms sometimes have meals served in their own rooms and it is then necessary to plan suitable small service pantries in association with the rooms or flats in which the meals are taken. It is quite usual, however, for senior staff to take meals in the common dining-room with the residents.

Domestic staff, if resident, is provided with all meals and often non-resident staff has a proportion of its meals at the hostel. It is therefore essential to provide a staff dining-room; this should be near the kitchen and servery; it should not also serve as the staff sitting-room, which should be a separate provision, especially as some may be off duty when others are having or serving meals.

SERVICES

### Hot Water

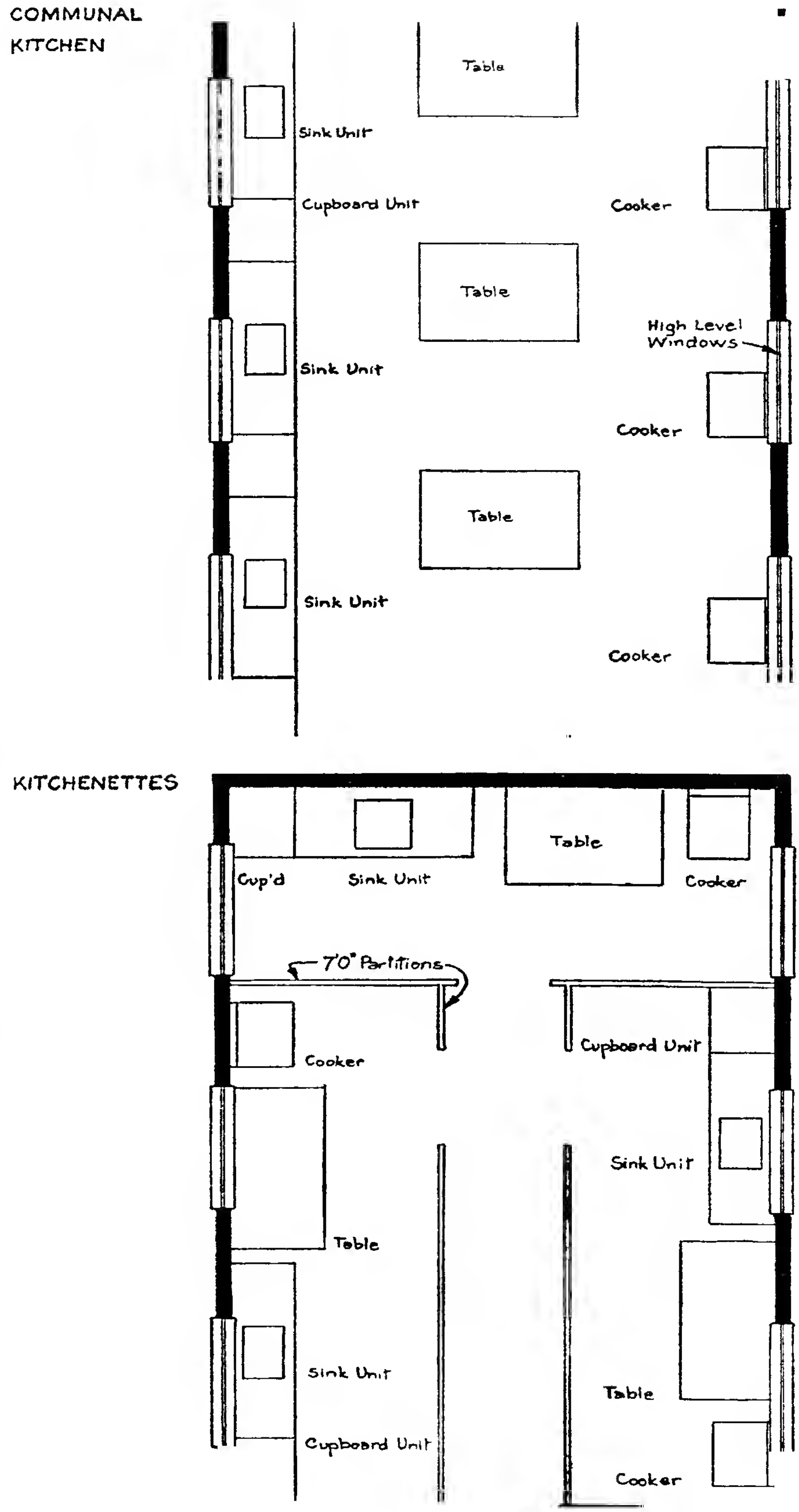
Constant hot-water is now essential in hostels of all types. It should be borne in mind, however, that the demand may be a variable one and likely to be concentrated within early-morning and late-evening peak periods. Considerable storage may therefore be required and time-lag factors must be reduced as much as possible. The normal demand may be taken to be at least 15 gallons at 120° F. per head per day and this may be much larger in high-rental types or in those hostels providing large restaurant or canteen or full laundry facilities where higher temperatures may also be needed.

### Heating

Some form of central heating will be required in the common rooms of practically all hostels, except the smallest types, where heat might be reasonably provided by solid-fuel or gas or electric fires. Some lower-rental hostels do not provide heating in bedrooms; the demand for this service, however, is rapidly increasing, particularly where there are dormitories, which do not permit easy installation of alternative methods. For bed-sitting-rooms or study-bedrooms central heating may be required to provide either general background heating or the sole means of heating. Where used for background heating purposes only, supplementary gas or electrical heaters are usually installed, as the demand for heating tends to be very varied and intermittent. Children's hostels and those for old people should have central heating throughout.

### Cold Water

Cold-water storage should be designed on a basis of at least 20 gallons per bed per day. It is better to allow for 30 to 40 gallons, especially if a hostel is planned with fully equipped kitchens and/or laundry.




Right: Fig 5 Residents' kitchens and kitchenettes

**Sleeping-Accommodation**

It has already been stated that most hostels are to a greater or lesser degree affected by legislation; the overcrowding requirements of Section 57 and the Fifth Schedule of the Housing Act, 1936, and Section 10 of the Housing Act, 1949, may be assumed to control minimum floor space for all sleeping-rooms in hostels, except those which should be controlled by Ministry of Education regulations for schools.

50sq. ft. is thus the smallest space per person required in a dormitory and 70sq. ft. should be the area allowed for the smallest bedroom; some dormitories for juveniles have been planned on an allowance of 40sq. ft., but this would seem to be undesirably small.

If bedrooms are designed to accommodate more than one person, 110sq. ft. should be the minimum for two adults and 160sq. ft. for three adults. For any hostels other than those to be let at the lowest rentals, these minimum areas can well be increased considerably and it will be found that single rooms at 95sq. ft. to 100sq. ft. are often required, inclusive of fixed furniture or fittings such as cupboards.

When, however, bedrooms are to serve as bed-sitting-rooms, especially if they are to be occupied for long periods as in students' hostels, floor areas should be calculated at not less than 110sq. ft. per person and are better if in the 120sq. ft. to 140sq. ft. range. Double bed-sitting-rooms should be at least 180sq. ft. to 200sq. ft. in area; it is important that minimum room-widths be considered in association with the floor areas mentioned above. Single rooms should be at least 8ft. wide (better 10ft.) and double rooms at least 12ft., if adequate allowance for comfortable layout is to be provided.

Privacy in bedrooms depends largely on the amount of rent the occupier is willing to pay; although in some hostels for young adults, especially females, there is a preference for sharing rooms. When rooms are shared it is often necessary to provide for a minimum of three persons. The maximum number of persons in a dormitory should not generally exceed 20 and smaller numbers are to be preferred.

Sleeping-accommodation also varies considerably according to the type of resident and his or her vocational activities. Dormitories are usually required in common lodging-houses, some industrial hostels, children's hostels and those for juveniles. Dormitories divided to form cubicles by means of curtains or by more permanent or semi-permanent partitions are widely used in lower-rental types. Large bedrooms, shared by a small number of persons, are also widely used in hostels attached to factories and shops and for similar types of lower-paid office workers, although there appears to be an increasing tendency towards the provision of cubicles or single rooms even in these latter types.

Hostels in the higher-rental groups usually provide separate rooms although occasionally these are designed as rooms for two persons. As rentals increase bed - sitting - rooms become more general.

In hostels attached to educational establishments single study-bedrooms have become almost universal, but a few double rooms are sometimes included; in both high-rental types and university hostels there is often a demand for bedrooms and sitting-rooms or studies to be separate rooms and designed as a suite. Separate bedrooms are desirable in old people's hostels and in such projects some rooms or flatlets may be needed for married couples.

It should be emphasized again that the type of sleeping-accommodation and the constructional spans involved to provide it economically have a very considerable effect on the planning of the building as a whole; in other words, the layout of upper bedroom floors tends to dictate the spans available for, and therefore the planning of, the common rooms on lower floors.

**Dormitories**

Open dormitories are needed in certain types of hostel. It will be seen from Fig. 6 how 50sq. ft., the normal minimum floor area per person, can be set out. More area, however, is desirable if adequate space is to be provided between beds for circulation and for some storage accommodation. Dormitories or cubicles should provide a minimum of 50sq. ft. of floor area per person and about 400cu. ft. of air per person. The sizes set out for dormitories in boarding schools (*see* section on "Schools") are, perhaps, a better standard and, in any case, dormitories for children should follow the requirements there detailed.

The use of dormitories raises storage problems for clothing and other personal property, and dressing-tables may be needed. It is desirable in all dormitories to provide a bedside locker, or alternatively a dressing-chest, and either may be built-in fitments. Dressing-tables or chests at the rate of one per person can be provided at the end of the dormitory room, in the central gangway where there is sufficient width, or adjacent to each bed where the layout permits. Facilities for hanging clothes can be provided by wardrobe cupboards at the ends of the room or in a separate locker-room adjoining the dormitory. Except in children's dormitories, a chair at least should be provided for each bed. In better types of hostels care should be taken that the placing of artificial light makes it possible to read in bed without inconveniencing adjoining occupants. Windows should give rooms that are well-lighted and well-ventilated; it is important that opening lights are close to the ceiling and any opening portion should be designed to eliminate side draughts.

Dormitories divided into cubicles with permanent part-height partitions, curtains, or a combination of the two, are needed in many hostels. This type of accommodation may be planned in a variety of ways as shown in Fig. 7. Type A shows a dormitory occupying the full span which may be as little as 17ft. wide. Whatever span is used, the cubicle widths should not be reduced below 7ft. and 8ft. is better to give sufficient space for furniture and comfortable movements of the user. If tall hanging-cupboards are provided in each cubicle it is better if partitions are used in preference to curtains; this has some bearing on the type of bed-layout used. In plans of Type A, partitions are often used between units and curtains only to form the central passage division. A window should be provided for each cubicle in this type of plan.

Type B (Fig. 7), showing beds grouped in the centre of the dormitory, has the advantage that beds do not come immediately under windows; therefore there is less likelihood that windows will be closed and thus cut off cross-ventilation. Open dormitories are also planned on this arrangement of beds with a dwarf bulkhead partition, about 5ft. to 6ft. in height in the centre

of the room, into which the beds and dressing-chests between the beds can be recessed. In Type B it is better if the central division is always a partition rather than a curtain. This type, it should be noted, calls for wider spans than Type A owing to the double passageways. It is undesirable to use solid partitions at the front of this type of cubicle as the air circulation may be reduced excessively thereby. It will be noted also that greater latitude in window spacing is possible with Type B.

Type C is a development of grouped beds, in which the passageway is kept to one side of the room and the beds are planned parallel to the length of the room; this avoids beds facing windows. This type is best with partitions across the room and curtains parallel to the outside walls, to avoid the central cubicles being too dark or badly ventilated.

Type D shows a form of double cubicle formed entirely with 6ft.-high partitions, with curtains used at the entrance to each compartment. This is slightly more economical in floor space as the dressing space may be reduced a little. When this type is used the curtained entrances should be staggered as shown.

Another type, often used, takes the form of small cubicles, with doors, exactly similar to single bedrooms as shown in Fig. 7, Type A or Type D, but taking divisions to a height of only 6ft. 6in. or 7ft. instead of up to the ceiling.

Where solid partitions are used the materials used should be reasonably fire-resisting. Partitions should be at least 6ft. high and the room height such that there is a clear 2ft. above them. Partitions are often kept 4in. to 6in. clear of the floor, except at structural supports, in order to facilitate cleaning.

Fig. 8 shows two types of " open " dormitory for various kinds of school and for seasonal buildings such as agricultural hostels. Type A is arranged to give 80sq. ft. per person with two beds in each bay on each side of the wing or span; Type B shows six beds per compartment, two on one side and four on the other arranged to provide the minimum area of 50sq. ft. per person.

**Bedrooms**

Fig. 9 shows separate bedrooms. Diagram A shows minimum-sized bedrooms on either side of a common corridor. Corridors serving bedrooms should not be less than 4ft. wide for comfortable circulation and for handling baggage and furniture; the width should be increased when longer than about 30ft. Double doors have to be accommodated to cut off stairs, etc. Doors to rooms on opposite sides of a corridor should be staggered and not be opposite to one another. It will be seen that with a minimum amount of furniture, namely a single bed, bedside table, dressing-chest, hanging cupboard and a chair, very little movement space is left for the occupier in an area of 70sq. ft.: thus an increase over this minimum should be provided whenever possible. In such small rooms it is of first importance to place windows and doors carefully so as to leave adequate space for the bed; positions other than in the centre of the rooms are generally advantageous. Except in very low-rental types allowances for bed-spaces should be 6ft. 6in. by 3ft. Whenever possible beds should not have a long side against a wall as this complicates bedmaking. Bedside tables should be based on 14in. by 14in., dressing-chests on 3ft. by 18in., wardrobes or hanging cupboards on 2ft. to 3ft. by 18in. deep (they are better 22in. deep) and chairs assumed to be 18in. by 18in.

Diagram B shows two alternative plans for two minimum-sized bedrooms; one with the beds along the division wall and the other with bed-heads against the division wall. In each example windows and doors are planned in relation to the beds in the room. Again it will be seen that the minimum floor space of 110sq. ft. is very small for comfort and should be increased whenever possible to allow the full quota of furniture for each person being installed as recommended above for single bedrooms.

Diagram C illustrates a room for three beds based on the minimum floor area of 160sq. ft.; this permits only a minimum amount of furniture and it is forced into positions which are bad in relation to daylight and windows.

It is advantageous to plan wardrobes, whether loose or built-in, against corridor walls, to reduce the incidence of noise from corridor traffic. In many schemes fanlights are required over room doors so as to light and ventilate the corridor. It is, however, better to avoid these in order to reduce noise; also continually-burning artificial lighting may be disturbing to occupants of bedrooms. As corridors are likely to serve as the main means of escape in case of fire, fanlights, when used, may be required to be fixed and glazed with wired glass, in which circumstance corridor ventilation must be obtained in other ways, for example, at the ends or by means of occasional bays opening on to windows and the open air.

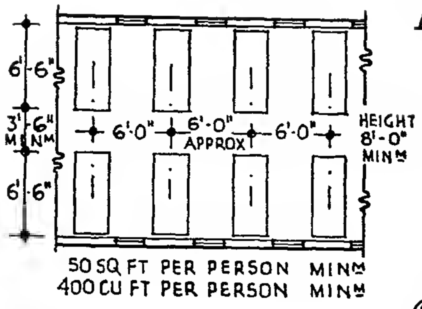



Fig. 6 Open dormitory

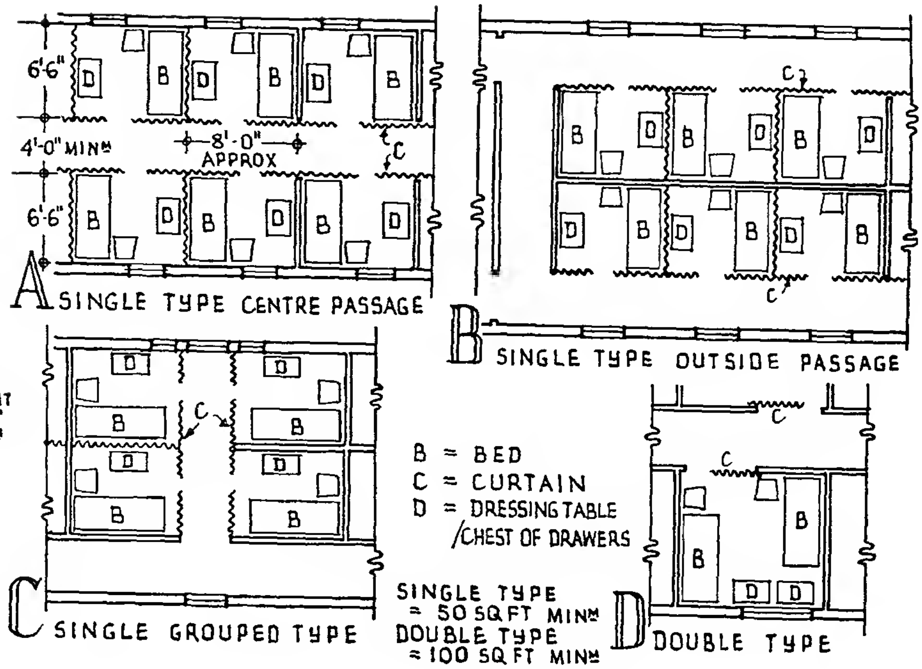



Fig. 7 Cubicles in dormitories

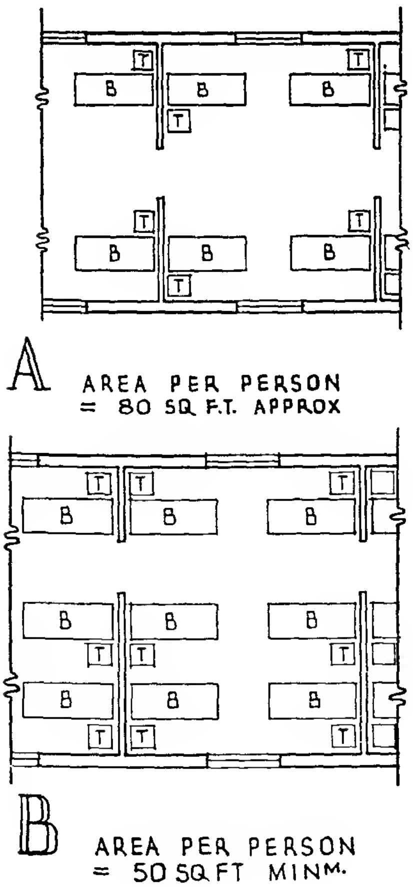



Fig. 8 Divided dormitories

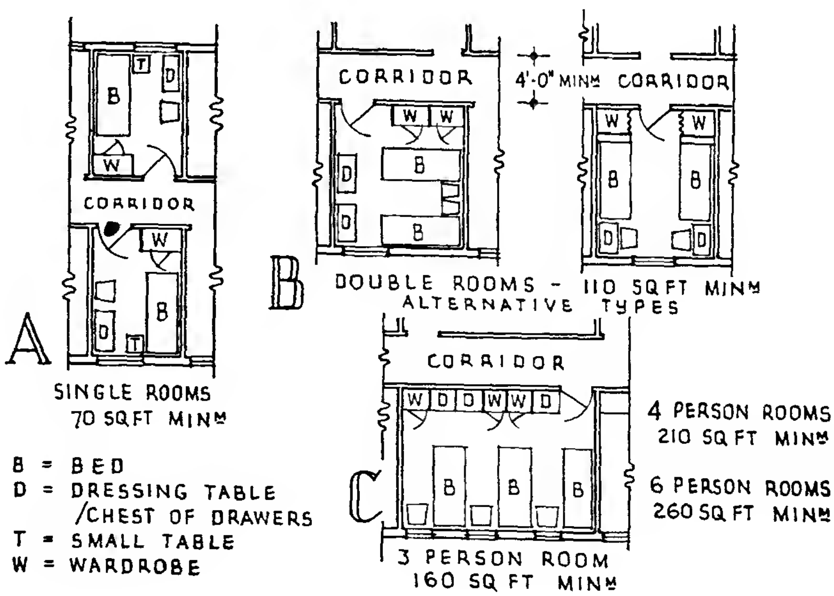



Fig. 9 Bedrooms in hostels

### Study-Bedrooms and Bed-Sitting-Rooms

Fig. 10 shows three typical study-bedrooms or bed-sitting-rooms based on minimum floor areas. The rooms should be laid out to provide space for the following furniture in addition to reasonable circulation space: Bed (6ft. 6in. by 3ft.); desk or writing table (3ft. by 2ft.); 3ft. run of bookshelves (9in. deep); a single chair (18in. by 18in.); easy chair (2ft. by 2ft.); dressing-chest (3ft. by 18in.); wardrobe or hanging cupboards full height of room (3ft. wide by 22in. deep inside). In many schemes it is necessary to plan also for a fire; this is now generally either electric- or gas-operated, either with or without slot-meters. In most modern schemes, however, a central-heating installation can be assumed at any rate for background heating. Space must, therefore, be found for radiators and, if the latter are only to provide general background heating, space must be allowed for an electric or gas fire in addition.

Diagram A shows a single room in which window and door are kept to one side to avoid the bed and also to provide good working light for the desk table. The minimum area is about 110sq. ft.

Diagrams B and C show double rooms with minimum floor areas of 200sq. ft. Diagram B is based on using a wide frontage and narrow span whereas Diagram C is based on a much wider span; the former is better for the users, but may be difficult and costly to superimpose upon accommodation planned on lower floors, as well as requiring proportionately longer corridors and runs of services. A small but important matter connected with hostel bedrooms is accommodation for damp towels; these usually are kept in the bedrooms and not in the lavatories; rooms should therefore be provided with a towel rack or rail in such a way that dampness does not cause damage to furniture or decorations. Where hot-water radiators are installed a towel-rail can be combined therewith.

Care should be taken to design wardrobes and cupboards properly to suit alternative needs of men or women; such fitments are likely to be the main clothing-storage space provided. Cupboards should all have permanent ventilation and be designed on the recommendations given in the section on " Housing."

Careful consideration should be given to planning artificial lighting so that adequate light is available at desks, at the bed-head, and for general lighting.

### Suites

Where suites of rooms are required these should be planned on the recommendations given in the section on " Flats." Bedrooms may lead directly out of sitting-rooms, but on no account should the approach from outside the suite be through the bedroom to the sitting-room.

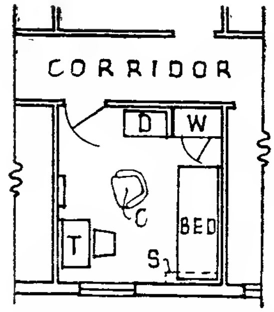
### Staff Bedrooms

These should be planned away from the general hostel bedrooms, or be cut off from them, or approached by way of separate service staircases. This accommodation may take the form of dormitories or be provided in double or single rooms (*see also* section on " Hotels").

### Sick-Room

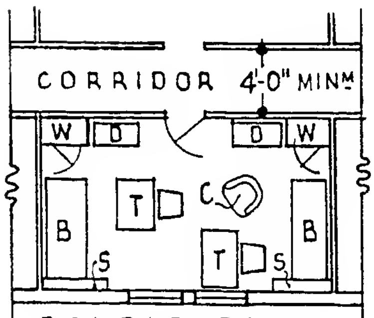
Provision should be made in all types of hostel, except perhaps in those with only single rooms, for residents with minor illnesses. Single- or double-bed wards or sick-bays are usually provided at the rate of about one bed per 50 residents. The rooms should be rather larger than the normal single hostel bedroom—about 100sq. ft. for single rooms and 200sq. ft. for two-bed wards. The wards should provide at least 800cu. ft. of air space per bed and beds should be planned to be at least 6ft. apart. Sick-rooms are generally planned near the sleeping-accommodation of whoever may have to look after the patients, e.g., matron, warden or housekeeper. Sick-rooms should have separate service and sanitary facilities comprising bathroom, W.C., kitchenette, housemaid's cupboard and small store room.

In hostels for children the sick-room accommodation should follow that detailed for boarding schools in the section on " Schools."

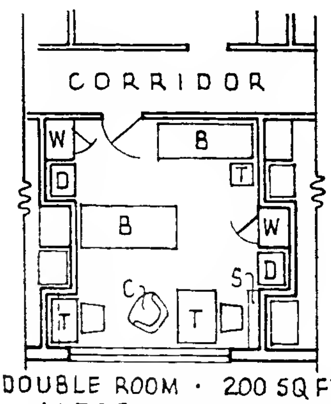



SINGLE ROOM
110 SQ FT MIN$^{M}$
A

KEY
B—bed
C—armchair
D—dressing table/chest of drawers
S—bookshelves
T—table
W—wardrobe




DOUBLE ROOM
200 SQ FT MIN$^{M}$
B




DOUBLE ROOM · 200 SQ FT MIN$^{M}$
ALTERNATIVE TYPE
C

Fig. 10 Layout of single and double bed-sitting-rooms

### Baggage

Storage of residents' baggage becomes an important matter if small bedrooms or studies are to be kept reasonably unencumbered. Although some accommodation for suitcases may be possible in cupboards in the rooms, it is usual to provide special baggage accommodation. The requirements can be divided into two parts: firstly the main trunk room where large and heavy baggage is stored and to which the residents do not require frequent access; secondly, small store rooms on each bedroom floor for suitcases and similar light luggage which may be needed more frequently for week-ends and holidays. It should be remembered that frequently hostels are almost the only homes of residents, who have no other place to leave or store property. There are, of course, some types of hostel which require very little baggage-storage space, such as children's hostels and those catering mainly for visitors or workers staying for short periods.

A main baggage or trunk room should provide for storing approximately 20cu. ft. per person, in such a manner that all articles stored are accessible without need to move other property. The room can be in the basement or similar unimportant position if dry and well-ventilated. The room should be fitted up with strong shelving for trunks, etc. The width of the gangways between shelving should be sufficient to allow standing-room while withdrawing a bulky trunk from a shelf. For hand-baggage rooms near to the users' bedrooms, any unimportant space may be used, so long as it is dry and ventilated. The rooms should be fitted with strong shelving, though it is possible to reducc the gangways by about 1ft. 6in. in width, and a third tier of shelving might be added.

### Housemaid's Cupboard

A properly planned service room or H.M.C. should provide for storage of supplies and materials together with all the necessary cleaning appliances, and a properly designed slop-sink with a draining-board.

These rooms should be associated with the sanitary accommodation in order to assist services. These rooms should have daylight or ample alternative ventilation. Shelving is needed for materials and suitable racks and hooks for brooms, etc., and facilities for drying cloths, etc.

### Linen and Mending

Two rooms are generally needed in all larger hostels for the handling and maintenance of linen; in small hostels one room is usually adequate for storage and repairs. The main linen room has to serve for the bulk storage of linen; from it subsidiary linen rooms on the bedroom floors are supplied; it also has to serve as the space for the sorting of clean and dirty linen coming from and going to the laundry. Thc area is, of course, dependent on the size of the hostel and also on whether the personal laundry of the residents is also to be dealt with, e.g., the larger quantities generally necessary in hostels for children or men.

A second room is required for the use of the staff which repairs linen. More space will again be wanted if residents' clothing is also repaired by the linen-room staff. (*See* the section on " Hotels.")

### Cloaks

Some cloaks space conveniently near the entrance and the dining-room is needed in most hostels where residents may leave outdoor clothing without the necessity of going to their bedrooms. In hostels for children and in those where working-clothing is always changed on entering the building, cloakrooms may also be needed near secondary entrances. In hostels for students cloakrooms may be required also to act as changing-rooms for games purposes and some bathroom or shower accommodation adjoining may become necessary.

In the normal type of cloakroom it is usual to provide racks with hat-and-coat pegs and umbrella stands, but in some, more elaborate coat-hanger equipment is installed; hat-and-coat pegs should be placed at 12in. centres on single rows for adults and at 10in. centres for adolescents; cloakroom equipment for children should follow school practice. Smaller cloakrooms may also be needed in association with visitors' rooms, especially to cater for visitors of the opposite sex and for social occasions; in most cases these should have sanitary accommodation attached.

### Sundry Special Rooms, etc.

The following accommodation is sometimes required in addition to that usually required and already detailed. Room for boot and shoc cleaning: on each bedroom floor, adjacent to the H.M.C.s or personal laundry room (if provided). Cycle storage: may be in separate closed or open sheds, or in the basement; ramps (1 : 12) being provided for the latter position (*see also* sections on " Schools," etc.).

Changing rooms and/or lavatories for non-resident staff: preferably on the ground floor and near staff entrance. Staff common rooms: may be required in the larger type of hostels.

Male porters' changing room and/or lavatory: this may be a special requirement in connection with women's hostels in which only a few men are employed. Such staff may be resident or non-resident, according to circumstances.

### Guest Rooms

Some hostels, especially those for middle and high income-groups, set aside one or two bedrooms for visitors which may be hired by the residents for their guests, but it is doubtful if space will normally be afforded for this purpose or this accommodation be sufficiently remunerative for general adoption.

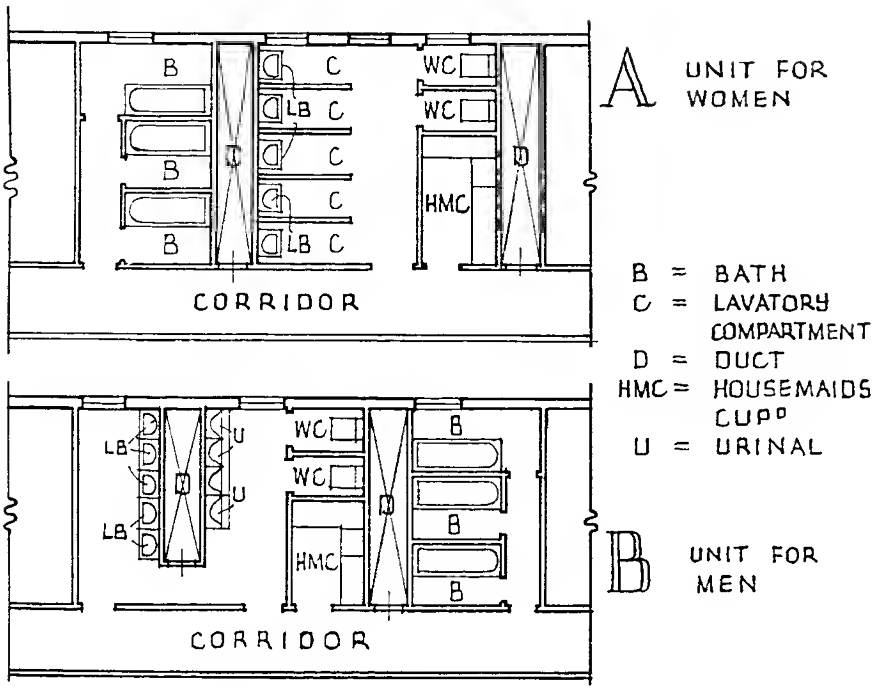
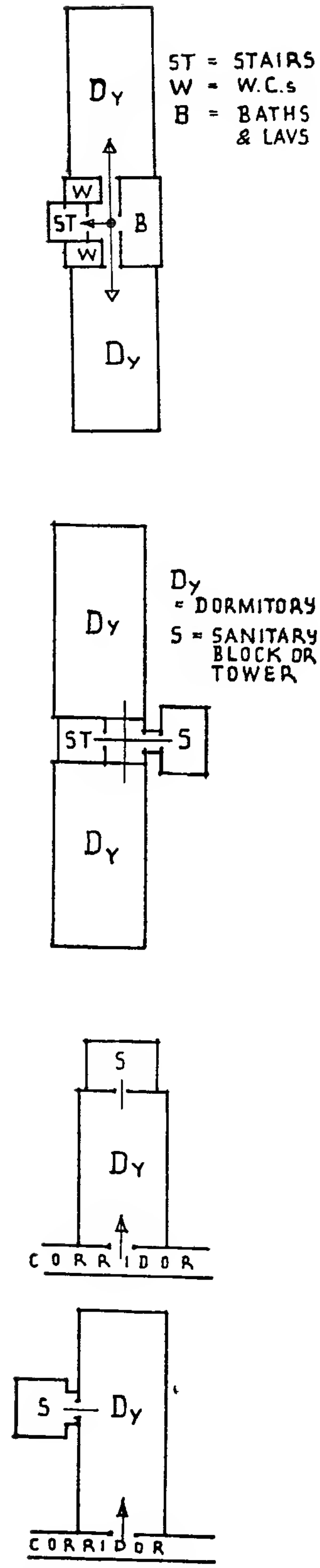



Fig. 11 Sanitary accommodation common to several bedrooms



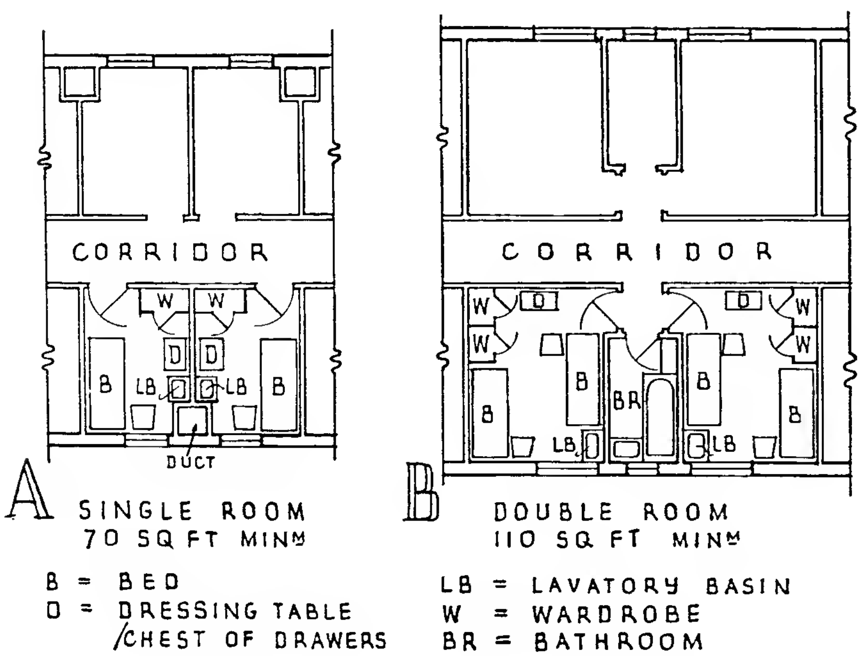




Fig. 12 Lavatory basins in single rooms; sanitary accommodation shared by two rooms

Fig. 13 Position of sanitary accommodation

### Sanitary Accommodation, General Considerations

Some accommodation should be planned on the ground floor or basement for daytime use and in connection with common rooms. In some types such as those for children and old people and common lodging-houses this is likely to be the greater part of the total accommodation. When bed-sitting-rooms reduce the common-room areas a larger part of the total sanitary accommodation should be distributed among the bedroom floors. In hostels for young children the ground-floor accommodation should be planned in close proximity to the day-rooms as in nursery schools.

### Sanitary Accommodation

The distribution of the necessary fittings throughout any hostel is much influenced by the type of resident and especially by whether bed-sitting-rooms are provided, as these probably mean that the bedroom floors are used to a greater extent during longer hours per day; thus more fittings are needed on these floors and less on the ground-floor and/or common-room levels. It will also be obvious that the relative proportions of the bedroom and common-room accommodation will also affect plan locations.

The number of sanitary fittings required is variable, but the following figures may be taken as a general guide:

W.C.s—two per ten persons.
Baths—one per ten persons.
Basins—one per three persons.
(Minimum.)

A proportion of the baths may be provided in the form of showers in hostels for youths and men. The installation of shower-baths in hostels for women, children and old people is seldom required.

It is desirable that basins be provided in all single bedrooms and in bedrooms for two persons, but if bedrooms are shared by more than two persons it is better to place the basins in lavatory groups convenient to a number of rooms. Where basins are grouped it is usual to keep them separate from the baths. Basins in women's lavatories should be planned in separate cubicles at least 3ft. wide and 6ft. long. The entrance end of the cubicle (opposite to the basin) may be open or fitted with a curtain (*see* Fig. 11). When a number of basins is used in lavatories it is better if the basins are spaced apart to provide ample elbow-room, rather than to use ranges where the basins are abutting.

Where bed-sitting-rooms or study-bedrooms are used (*see* Fig. 12) opinions vary greatly as to whether or not basins should be installed, but there seems to be an increasing preference for basins where the resultant cost of widespread plumbing installation can be met. It is desirable, however, that basins should be so placed in rooms that they can be screened easily, or shut away within fitments.

Where the plumbing services are so widely distributed, it is better to distribute bathrooms rather than to concentrate them in groups. The cost is not thereby increased and users have the minimum distance from bedrooms to bath and an additional degree of privacy. Such an arrangement is shown in Fig. 12, Diagram B, where a bathroom is planned between two adjoining bedrooms, thus the basins in the adjoining rooms and the bathroom fittings are connected to a single set of up and down services.

The W.C. allocation may be reduced in men's hostels, if sufficient urinals are provided.

In children's hostels the number of sanitary fittings should be based on the requirements for schools, according to the age-groups to be catered for (*see* section on " Schools ").

The placing of sanitary accommodation relative to dormitories often presents difficulties. It will be preferable to plan sanitary units between the main circulation (staircases or corridors) and the dormitories (*see* Fig. 13). Thus two dormitories may often be served by one combined unit, with corresponding simplification of plumbing and services. In such a position access from dormitory to sanitary unit does not waste space in the dormitory.

Sanitary units planned at ends of the dormitories opposite the entrance to the room or on the sides of the latter tend to cause disturbance, especially in hostels where residents get up or go to bed at widely varying times.

Staff, both resident and non-resident, must, in any large hostel, have their own sanitary accommodation located in the parts of the building most used by them. Managers, housekeepers and similar officials usually have a bathroom and W.C. as a unit within their flat or attached to their rooms.

### Laundries

Few hostels are sufficiently large to require independent laundries. In order, however, to discourage residents from using lavatory basins for washing clothing, many hostels for women and even some of those for men provide special facilities for residents to do personal laundry. The equipment normally provided is one washtub per 25 and one ironing-board per 20 persons, and a number of small drying cabinets. Consideration should be given to the possibility of installing washing machines. Such laundry facilities are usually installed in separate rooms on bedroom floors, adjacent to the general sanitary accommodation, to simplify plumbing; in some schemes it has been found advantageous to plan the laundry in a group with the tea-pantry. Adequate electric or gas plugs should be provided, at suitable levels above the floors for irons, washing machines and drying machines as required.

Common lodging-houses and some hostels catering for low-income groups often provide a large communal laundry for the whole hostel on the ground floor or in the basement.

Special hairdressing and washing facilities are often provided in women's hostels. These should take the form of one or two basins in a room of about 100sq. ft. in area, in which also space should be planned for well-lit dressing-tables and mirrors; some plugs for electric hair-driers, etc., may also be needed as part of this equipment.

## INTRODUCTION, HOTEL STAFF

### Introduction

The basic principles of hotel keeping are summarized in the word " service," and everything connected with hotels has to become an adjunct to producing that " service " for guests. The five essential factors in good hotel-keeping and therefore hotel planning are:—

(1) Good and quiet sleeping facilities.
(2) Clean and comfortable rooms.
(3) Good food.
(4) Adequate service by the staff of all departments.
(5) Hospitality, both in fact and appearance.

All these factors must be introduced at reasonable cost to guests while, at the same time, a reasonable profit must be secured for investors. All this depends very largely on the efficiency of the building from the standpoints of planning, construction and equipment.

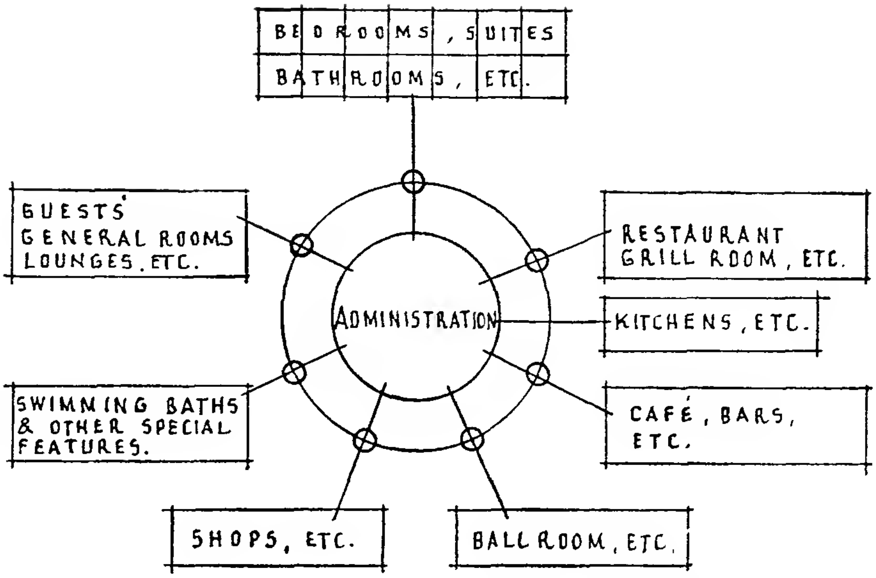



Fig. 1 The main divisions of the plan

The primary divisions of hotels are shown on Fig. 1, and are as follows: Firstly, the management, with all its subsidiary sections, such as accounting, buying, upkeep, staff, etc. Secondly, the bedrooms and bathrooms, with which should be coupled a third section, the public rooms, such as lounges. The fourth group comprises several subdivisions, all concerned with food services; the subdivisions are kitchens, restaurants, cafés, bars, ball and banquet rooms. The fifth group also comprises many subdivisions, including all those portions of the hotel which are partly or entirely self-supporting, or which may be operated as separate concerns, paying rent to the hotel management; shops, kiosks, swimming pools and Turkish baths come into this category.

Hotels must appeal not only as a home for the traveller and in some cases as temporary business headquarters but to local residents as a place of entertainment in so far as the bars, restaurants, banquet and ball-rooms are concerned. It must be remembered that in some respects hotels vary very greatly according to the type of guest and, to some extent, according to situation; some will cater for leisure solely, some for the wealthier type of business guest and others for commercial travellers. In the same way a seaside hotel has clients living a different hotel life from a railway hotel in a large business centre. Each slight variation must be considered from the first, as each may have effects on the final plan and equipment. Certain general factors will, of course, remain constant, but the architect must realize how each different type of guest will tend to use various parts of any given scheme.

There seems little doubt, although some hotel financiers may still disagree, that a successful hotel must be planned and built by close collaboration between architectural and managerial interests from the commencement of a project; even, if possible, before the site is purchased. The hotel, once built, has to stand until it has depreciated to such an extent that it is no longer serviceable for its original purpose and, although improvements may be made to some extent, they can only be effective within temporary limits: therefore the building must be planned and equipped in such a manner that there will be a constant market for its services for many years without excessive upkeep and replacement costs, and without the site becoming unsuitable through developments in the neighbourhood, which might have been foreseen, or at least anticipated.

### Hotel Staff

A further matter of general organization must be reviewed; the staff required for various departments and the contacts of the staff organization with the guests. The size of the staff of an hotel varies from about one member of staff to each six guests when the building is fully occupied, up to a proportion of one member of staff for each guest, which latter figure may easily come about in a luxury hotel which has a large catering department dealing with outside visitors. As a normal example it is interesting to note that 118 is the total staff figure for a certain provincial hotel having 130 bedrooms, 190 beds, 12 sitting-rooms, a restaurant seating 120, lounge, two bars and three rooms for dinner, dances, etc., seating 60, 130 and 250 respectively and having an all-the-year-round trade. This figure of 118 includes the manager and is roughly made up into four groups. Rooms, 37, including porters. Catering, 58. Wines and spirits, 14, and engineering and upkeep, 9. Fig. 2 illustrates the organization of personnel connected with a large hotel—from the shareholders to the least important members of the staff. Control is exercised by the manager through the general office and then through more or less separate units only partially dependent on one another.

The guest comes into direct contact with only certain sections of each department and has direct dealing with a few members of the staff who are, as a general rule, the heads of the departments.

## Types of Hotel

It is difficult to divide hotels into rigid types as there are always many the trade of which includes two or three different sections of the public. The more general divisions are: large city hotels, smaller city hotels. hotels in seaside or other resorts and the smaller hotels in the lesser towns. Each of these groups may be divided into luxury, good, medium and cheap types, each concerning itself with guests prepared to pay according to various scales of charges but all expecting value for money.

## Size of Hotels

Hotel building presents two rather different problems depending on whether the scheme is concerned with an entirely new project or with the rebuilding of an existing hotel. The size of schemes falling within the latter category may be far more easily assessed, but for new projects it is an extremely difficult matter to decide how many rooms to provide, how many public rooms may be needed, what outside restaurant business may be expected. The size has to be decided by weighing up the merits of many factors, both as regards the situation of the town in which the hotel is to be built, the attractions of the town, both commercially and as a tourist centre and the number and proximity of similar hotels. New hotels should, whenever possible, be so planned that future extensions can be provided when increased business justifies increased accommodation; it is unwise to build a larger scheme than is necessary for present needs, as the interest on the capital costs of the empty portions becomes a severe tax on profits.

## Sites

The choice of a suitable site for an hotel is usually a matter of choosing from a number of possible sites that which has the greatest number of good features or the fewest defects, as no site is likely to have all desirable merits.

The main factors may be roughly divided into three groups, as follows:—conditions of surrounding property, conditions relating to the site itself and financial aspects of the site. In addition

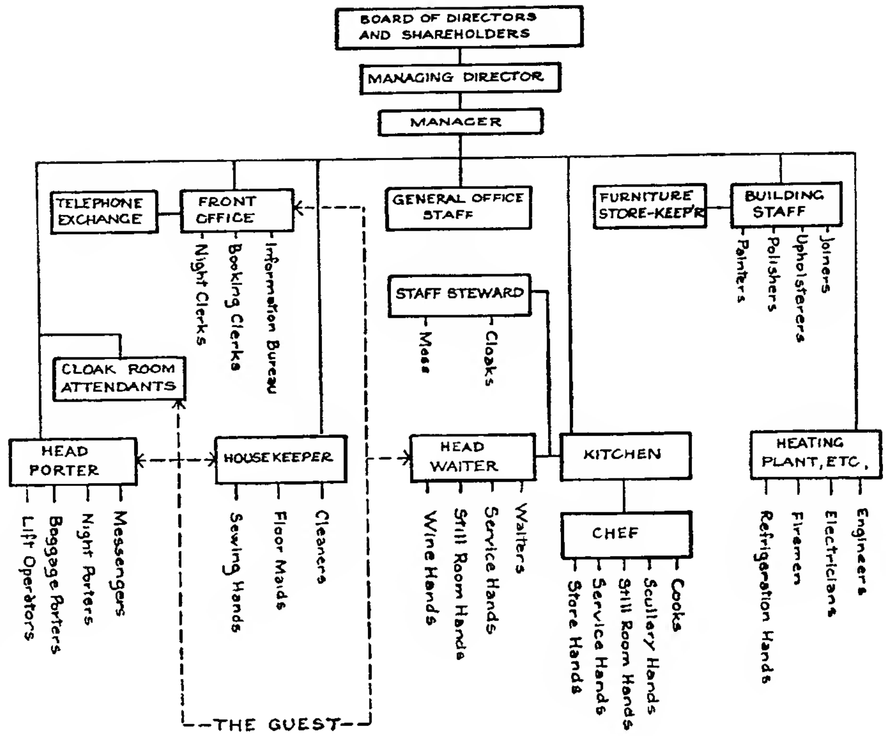



Fig. 2 The hotel organization

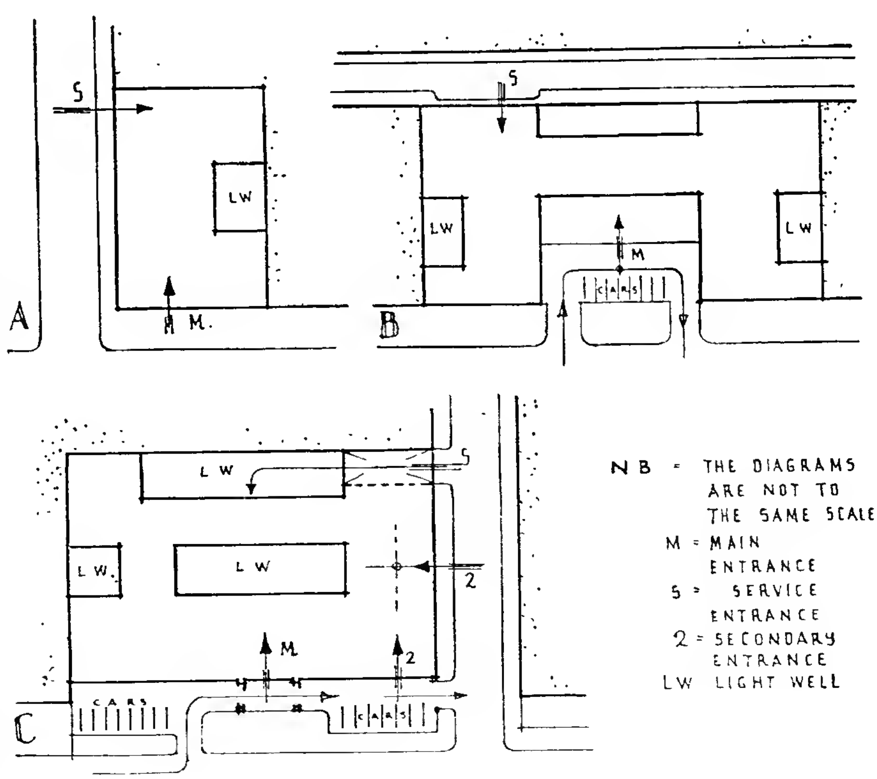



Fig. 3 Site considerations

to these three groups there is a number of miscellaneous matters which have some bearing on the selection in certain cases. The following are the factors affected by surroundings:—

(1) Proximity of transport, especially railway stations.
(2) Existing or growing social centre.
(3) Special attraction in location, such as proximity of parks or open spaces.
(4) Easy access to business districts and amusements.
(5) Residential or non-residential area.
(6) Quietness at night.
(7) Access for service deliveries.
(8) Garage facilities with easy access.
(9) Suitability of ground-floor street frontages for shops.
(10) Class of surrounding property and freedom from noise or fumes of industrial buildings.

The factors affected by the site itself are mainly.—

(1) Size and slope of site.
(2) Orientation.
(3) Relation to surrounding property, including matters of easements and building heights.
(4) Relationship to traffic in surrounding streets.
(5) Good subsoil to eliminate excessive foundation costs.
(6) Possibility of providing garage and/or parking arrangements.

The financial factors are:—

(1) Well-established and increasing land values.
(2) Experience of other buildings on similar sites.
(3) Possibility of landowner's assistance in financing of scheme.

The factors must be weighed up and a decision made from complete analysis to see whether the site is suitable for an hotel and, if so, for what type of hotel.

A commercial hotel should be nearer the business section of a city than a first-class hotel; prospect, noise and light are also of less importance for commercial hotels. The businessman should be near to means of transport. Hotels proposing to have large restaurant accommodation should be near "crowd" centres and amusements. A first-class hotel can often be placed on a comparatively small site in a good district where a cheaper grade of commercial hotel would be unsuitable, the reason being that a high income derived from interest on a ground value involves first-class prices for a number of rooms.

Areas of the rooms vary only slightly with the type of hotel. In sea or riverside schemes, or inland resort hotels, proximity to local attractions and the immediate site surroundings are of the utmost importance. An important matter, sometimes overlooked in preliminary stages, is ease of access for goods to the kitchens and stores. Traffic in the surrounding streets should be considered from the point of view of vehicles standing at doors, occasionally for long periods. Entrances to restaurants and ball-rooms must be easily accessible and, if possible, some space for parking waiting vehicles should be provided.

Fig. 3 illustrates three typical hotel sites. Site A is small and rather congested; the main entrance is placed in the most important street and the service entrance as far from it as possible in the side street. Site B is such that vehicles can enter the site to reach the main entrance, leaving a small area for parking ; the service approach is in the back street. Site C is also a corner site as in A, but has the larger frontage to the main road; the building is set back to allow parking space and also so that vehicles may reach the door without passengers having to cross the pavement. Two subsidiary entrances are provided which serve rooms such as the grill-room and ball-room, visitors to these rooms being thus separated.

The service entry is again at the back of the site, the vehicles pass under part of the building and by means of a ramp make their deliveries to the basement at the level of the store-rooms; an arrangement now required by Town Planning authorities where high-density traffic streets are involved. Congestion of traffic may materially affect popularity of the hotel.

## General Planning

This can be classed in four main divisions. Firstly, public rooms, such as the cntrance hall, lounges and dining-rooms; secondly, rooms for functions, such as dinners, dances and social entertainments; thirdly, bedroom floors; lastly, the services, such as kitchens, boiler-rooms and accommodation for similar equipment.

By far the most important is the bedroom group. The typical plan of the bedroom floors is the governing factor of the whole design and it is essential to settle this before anything but the bare outlines of a general plan is decided, together with positions of main entrances, staircases and lifts. The reason for making the bedroom floors such a deciding factor is that bedroom accommodation should be considered as the main thing which an hotel has to sell and the income and success of the hotel depend to a very great extent on the satisfactory and economical layout of these floors. The basis of the bedroom layout should be the bedroom unit and not necessarily the steel layout, which should be subordinate to the bedroom unit plan.

The bedroom plan shapes most generally adopted for hotels are illustrated in Fig. 4, but, except when the dimensions of the site make it essential, a plan shape which builds up the perimeter of the site around internal courts should be avoided and shapes such as the " E," " H " or " X," or multiples of them, should be preferred. The reason for using " open " or three-sided court types is to provide as many " outside " rooms as possible, as rooms overlooking internal courts are not popular among guests, unless noisy streets surround the site. The maximum number of " outside " rooms (or rooms " with a view ") should always dictate plan shapes for seaside and other resort hotels and for all hotels on uncongested sites.

Below typical floors it is usual to build over the greater part of the site. Rooms, such as lounges and restaurants, may be top-lit and artificial ventilation employed. This eliminates many ventilation areas or courts which were necessary in older schemes.

The height of the building is generally controlled by regulations or surrounding buildings and care should be taken that public rooms are not so high as to prevent the construction of an extra floor of bedrooms in a given total height. Public rooms should, as a general rule, be placed on the ground floor and sometimes at basement level. Occasionally public rooms limited to the sole use of the hotel guests and not for casual visitors are placed on the first floor, but this is apt to confuse, or at least make difficult, the planning of that floor as it is not easy, in these circumstances, to plan bedrooms and public rooms which are absolutely separated. Rooms on higher floors are less noisy, less dusty and receive more light and air than those on lower floors and command higher rentals if a good and adequate lift service is installed.

The placing of the service and power units of the building, although these are unseen, should have careful consideration, as this section is really of greater importance to the guests' comfort than even the public rooms. These service units must be placed in close relationship to those rooms which need the greater part of the various types of mechanical or service output and must also be considered very carefully from the point of view of the vertical communications—leads, pipes, ducts, etc.—which have to be taken to all floors and through all floors.

One important American authority suggests that the basic test of the efficiency of an hotel plan, from the standpoint of profitable operation, is the amount of cubic content per guest and suggests as a guide that a carefully planned hotel of a good-class character, for 200 guests, should not exceed one million cubic feet, exclusive of shops or other external space producing satisfactory rent returns.

By analysis it seems, however, that few hotels will stand this test if many bathrooms have to be provided in proportion to the number of bedrooms, but the figure provides a useful guide.

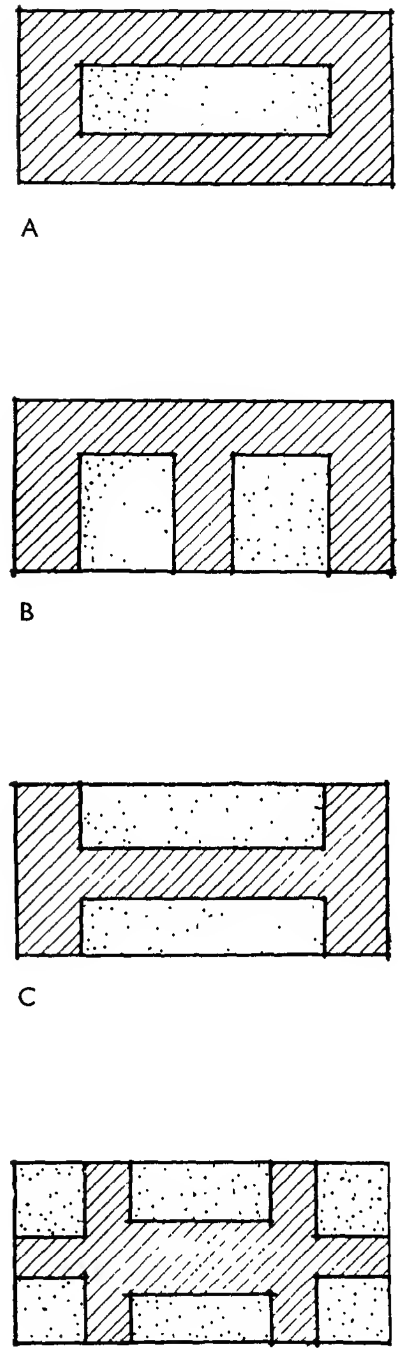



Fig. 4 Light and air in the plan (upper floors hatched)

### Entrances

Entrances are of four main types. Firstly, there is the main entrance to the hotel itself. Secondly, there are subsidiary entrances, either to the hotel or directly to rooms such as restaurants and ballrooms, which are likely to be used mainly by outside visitors rather than the hotel guests. Thirdly, there is the luggage entrance and, lastly, the goods entrance to the service departments of the hotel.

The main entrance should be from the most important street and subsidiary entrances from other streets; but it should be remembered that every additional entrance involves extra staff, such as porters, for supervision, the cost of which frequently cannot be justified. All entrances likely to be used by visitors should lead to a central space, and the main entrance must be closely related to the various desks for room clerks, enquiries, cashier and the head porter. Luggage entrances should be placed close to the main entrance so that luggage may be removed quickly from waiting cars or taxis, to avoid the necessity of these having to drive to another place away from the main entrance to unload. The proximity of the luggage entrance is very important, when guests are leaving the hotel, to avoid delays. Except in very small hotels, luggage, other than small hand-baggage, should never be taken through the main entrance into the vestibule, but should go to bedroom floors by means of service lifts. The passenger lifts should not be used for this purpose.

Subsidiary entrances leading to special rooms, such as the grill-room or banqueting-suite, should be so placed that vehicles arriving at these entrances do not disturb the main hotel entrance; also, if special entrances are provided for certain rooms, they should lead thereto as directly as possible, with only suitable vestibules and lounges in which visitors may wait for friends and from which cloakrooms may be approached.

Service entrances should be as far from guest entrances as possible and, when the site permits, they should be in different streets. They should be placed near the departments which they are to serve and should have space in which vehicles may stand while unloading without disturbing the general traffic on the road. It should

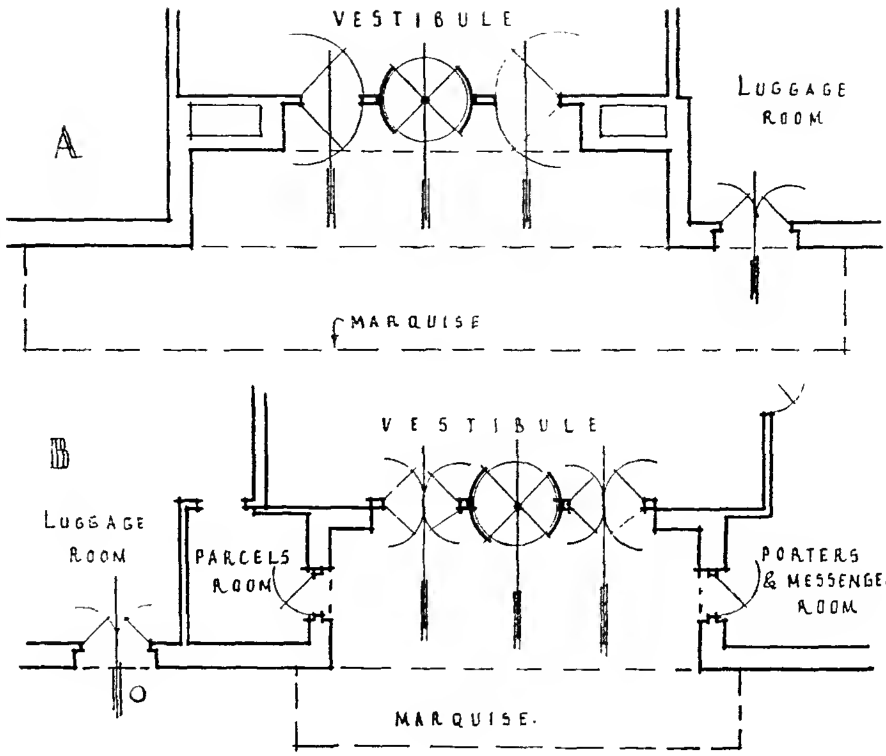



Fig. 5 The main entrance: typical plans

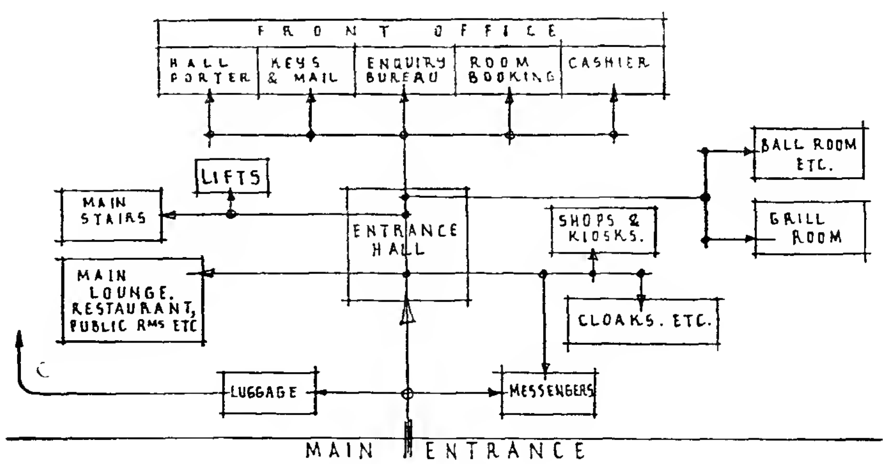



Fig. 6 Entrance hall: plan analysis

be borne in mind that goods entrances may be noisy and every effort should be made to prevent noise disturbing guests in rooms above.

The actual size and number of doors in each entrance must be dictated by the requirements of each individual scheme, but it is wise to err on the generous side in order to be sure that there will be no congestion. Marquises should be placed over the pavement, to the width permitted, at all entrance doors; these marquises are not only useful in wet weather but also mark clearly the position of entrances for approaching vehicles. It is customary and advisable to install revolving doors at guest entrances to reduce draughts and cold, but when they are used, ordinary swing doors should be provided in addition on one or both sides for use during rush periods. The actual doors must be set back from the frontage line to accommodate the outward swing as they should always swing both ways, but this set-back is also desirable as a pause between the doors and the pavement. Fig. 5 illustrates two typical main entrances to hotels, together with luggage entrances. The luggage entrance cannot have steps as barrows have to be used to move heavier baggage; the luggage doors should be about 5ft. wide in the clear. Revolving doors, when used, should be at least 6ft. in diameter. Service entrances will be discussed in greater detail later.

### Entrance Hall

The main entrance hall is the centre upon which the whole working of the hotel turns, so far as the guest is concerned. Efficiency in the planning of the entrance goes a long way towards making an hotel successful, as the quickness and ease of service given to the guest at this point often have considerable effect upon him, while congestion creates a very bad impression. Fig. 6 shows a general analysis of the various circulations of guests in the main entrance hall. This hall is generally a lounge, adjoining which are various offices or counters dealing with enquiries, rooms, letters and cash. There may also be shops or selling-counters round part of the entrance hall. In some hotels this entrance hall is kept small and cut off from the general lounge but in others it is only part of a large lounge, placed at one side or end, and not even separated by screens. The guest, on entering the hotel, wishes to go as quickly as possible to his bedroom where he leaves his property. Before going to one's room it is necessary to register and obtain a room key; the circulation, therefore, should link the entrance to the lifts, passing the necessary registration and key desks on the way. These various desks or counters should be placed where they may be quickly seen by the guest on entering and should have ample length in proportion to the number of guests; they should be so placed that persons waiting do not disturb circulations. All counters dealing with guests and their rooms should be grouped together and should only be sections of one long counter, except for the hall porter's desk.

The front entrance hall should give direct access to the main lounge from which the other public rooms may be approached, while corridor connections may lead to other rooms, such as the grill- and ball-rooms. Cloakrooms should be accessible from the main entrance hall. The lifts and main staircase serving the bedroom floors should be placed so that they discharge into this main hall, but they should be placed to one side and not in such a position that they disturb the main entrance circulations. It is better if lifts, which are the main means of vertical circulation, are easily visible from the enquiry and key desks, while the staircase, which needs less control than a lift (which has an attendant), should be so placed that the porter can have visual control from his desk to prevent persons other than guests having access to bedroom floors. As the staircase, except in hotels having few floors, is no longer used to any large extent, unless it also gives access to public rooms on a mezzanine or the first floor, it need not have a prominent position on the ground floor, but on upper floors it is advantageous to group the lifts and main staircase together to form a main approach to each floor of bedrooms.

Most hotels have at least one shop or kiosk in the entrance hall at which newspapers, tobacco and confectionery are sold, and in large hotels these become of great importance and are very valuable revenue assets, whether operated by the hotel or leased as concessions. Also in larger hotels it is general to have hairdressing saloons, which, however, do not affect the planning of the main entrance hall as they may be placed in basements or on a mezzanine or first floor.

### Vertical Circulation

Efficient vertical circulation is of the utmost importance in economy of operation and convenience to guests. Lifts are more important than staircases, both for guests and for service purposes and should therefore have primary consideration. Staircases, except in buildings having two or three stories only, are little used unless certain of the public rooms are on the first floor, in a mezzanine or on basement level. The service staircases are used for staff circulation; maids use them when passing from one floor to that immediately above or below, but not, as a general rule, when several floors have to be passed. Some hotels, however, do not permit the lifts to be used by maids or bedroom-floor staffs, but only for general access and by porters, messengers, etc., who may be actually serving guests at any given moment. Service staircases also serve as escape staircases for guests and should therefore be placed to be in accordance with fire regulations. Fig. 7 illustrates vertical circulations and the floors which each staircase or lift normally has to serve. The main staircase should serve all floors to which guests require access; its plan position may, however, be moved at first-floor level, as it is at this level that typical floor plans generally commence. On the ground floor the lowest flight must be in good relation to the general layout of the main entrance hall. This main staircase need not be continued to basement level unless to serve important rooms for guests' use, such as grill-rooms or ball-rooms. A subsidiary staircase is sufficient for access to rooms of lesser importance, such as the barber's shop.

Service staircases must connect all floors, since they also act as escapes, but their positions may be slightly changed above and below the street level. They must give access to the street in some way if they are to be used for fire purposes and must be properly cut off in the usual manner. Additional staircases may also be needed for staff access to basements from the street level at staff and goods entrances, to boiler-rooms and to workshops; also direct staircases connecting kitchens to restaurants and banqueting-rooms. The latter should serve only their own particular purpose, to avoid interference and congestion of food

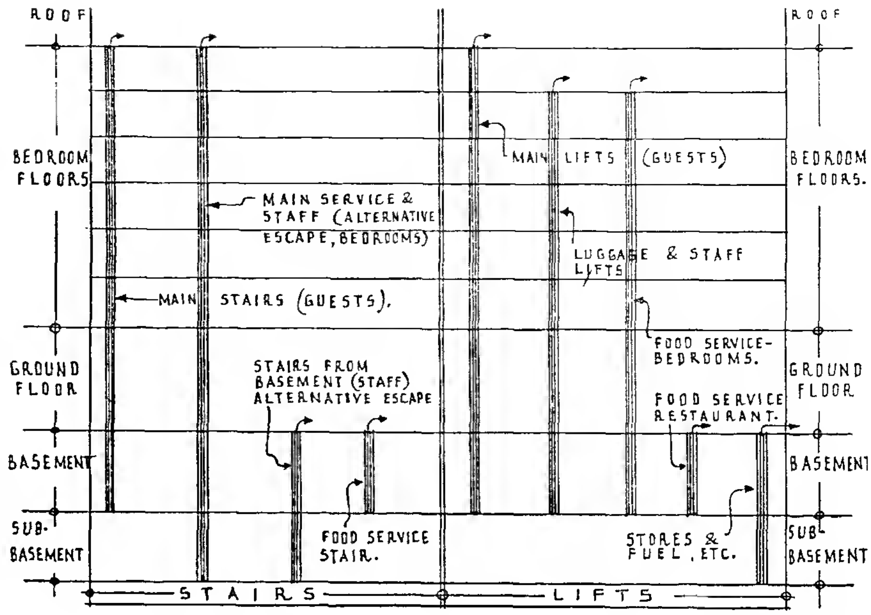
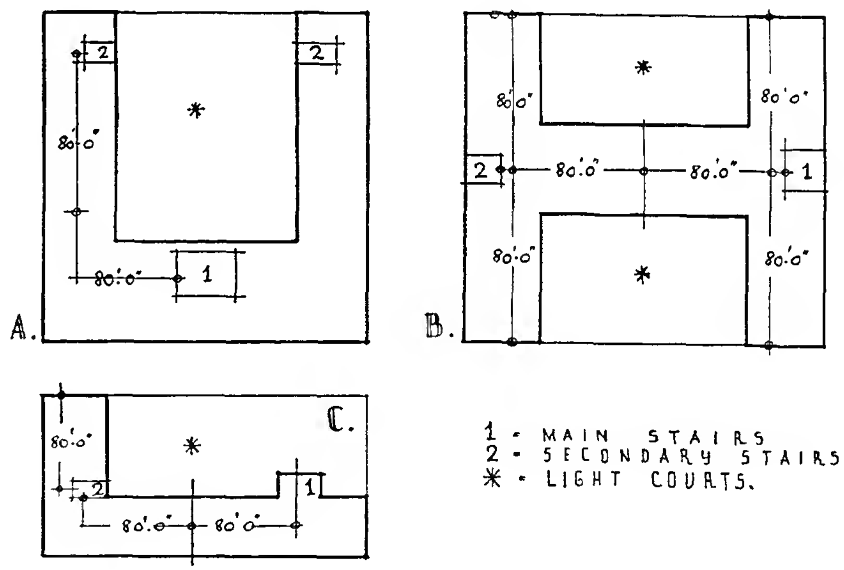
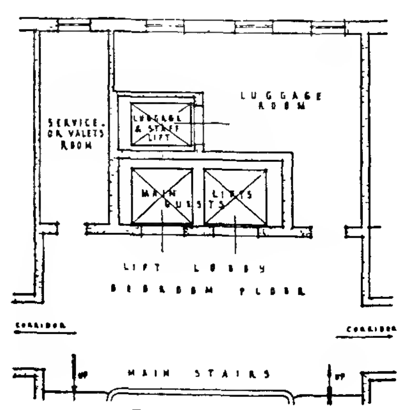



Fig. 7 The vertical circulation




Above: Fig. 8 Staircases: positional factors




Right: Fig. 9 A typical lift layout

service. Lifts are also separated into groups for each special function. Lifts for guests should serve all floors and should in no circumstances be used for transport of goods, staff or luggage, except in small or low-price hotels. In addition to the main lift service for guests, some large hotels which have an important catering section for the use of casual visitors (not guests), find it necessary to provide lifts connecting the entrance floor to special suites or rooms, such as restaurants or banqueting-rooms, which may only have a travel of one or two floor heights. The service lifts have the transport of guests' luggage as their chief function and are also concerned with the transport of supplies, such as linen, from the stores to the various floors. In all hotels of the higher-priced grades there should be direct connection between the kitchen and the food-service rooms on each floor. There may also be lifts, dumb-waiters, or continuous conveyors connecting the restaurants to the kitchen if these are on different floors; if these are required, they should connect these rooms only and serve no other purpose.

Lifts or hoists may be required at fuel and goods entrances to convey goods from street level to basements or sub-basements. There are certain lines of vertical circulation which are essentially equipment for special purposes and also are only in use in a limited number of hotels. The equipment may consist of chutes for soiled linen from all floors to the dirty-linen store and for rubbish and waste paper to a collection and disposal room. Both these installations save work for the staff and help to reduce congestion on service lifts.

Fig. 8 illustrates factors governing positions of staircases in three typical hotel plans. In all districts an alternative means of escape should be provided to every bedroom. Diagram A shows a plan shape in which the main staircase is placed centrally, so as to serve the whole of the floor area, with two secondary or service staircases at the ends of each wing. The by-laws of many districts do not permit the distance between any room door and a staircase to exceed 80ft., thus limiting the corridor length between two staircases to 160ft.

Type B is based on the assumption that rooms may be placed up to 80ft. from a staircase, in which case two staircases, one main and one secondary, serve the entire building. This has a fault in that the main staircase, which the main lifts would probably adjoin, is so placed that many guests have a long walk to their rooms; this is avoided by the placing of the main staircase in the way adopted in Type A. Type C is also based on one main staircase and one secondary staircase; this gives a very economical layout and also one which is very convenient in working. Any plan shape based on a cross with wings radiating from a central staircase and lift hall needs an additional staircase for escape at the end of each wing. This may not appear very economical, but is usually offset by the advantages gained in other ways, such as the elimination of light-courts.

Main staircases should be wide and easy-going, with continuous handrails on both sides from floor to floor. Service staircases need only be of the widths dictated by local by-laws to comply with fire regulations; these are usually cut off at the various floor levels in such a way that appearance and finish is of little importance and materials must therefore be selected to withstand hard wear without undue first cost. The main staircase generally has to connect floors in which there are public rooms, and materials and design should therefore be considered mainly from the point of view of effect. All main staircases should be covered with carpet to ensure quietness and good appearance.

Lifts are of the utmost importance, even in small hotels and low-price grade hotels. Many hotels cause considerable inconvenience and annoyance to guests by having a badly organized or insufficient lift service. Whenever possible at least two lifts should always be installed to handle rush demands properly and also to guard against possible breakdowns. Passenger lifts are better in the form of a battery of small, fast-running lifts rather than one or two large cars, the only drawback being that additional staff is needed to take charge of each car, as few hotels have, up to now, adopted the push-button type operated by passengers. Two passenger lifts should be sufficient to take care of 200 bedrooms, unless the plan is very spread out, when it may be necessary to have an additional lift placed away from the main lift battery and main staircase. A ratio of one lift for every 100 bedrooms is a desirable minimum.

Service lifts should be provided at the rate of two for every three passenger lifts, exclusive of any lifts devoted to food service to bedroom floors. Service lifts must be designed for heavy loads. Freight lifts must be of sufficient size for the transport of bulky articles, such as wardrobes, box-spring mattresses and loaded luggage trolleys.

Ample space is needed in front of all passenger-lift doors, so that waiting passengers may stand without disturbing main circulations. It is an advantage to have the main staircase and main passenger lifts on two sides of a single lobby, which should be much wider than the normal corridor width. Fig. 9 illustrates a typical lift lobby layout on a bedroom floor; two passenger lifts are on one side with the main staircase opposite; the lobby is formed by increasing the corridor width on the lift side, to provide ample waiting space. This is obviously not so necessary for the staircase. The figure also shows several other important points. The main luggage lift is placed behind the passenger lifts, thus grouping all lift machinery and wells together. The luggage lift discharges into a luggage room which is fairly centrally placed if the main lifts are in the central position they should occupy. Isolation of the lifts from bedrooms by the luggage and service rooms is indicated; lifts may be noisy and spoil the letting value of any room which adjoins a lift shaft.

## BEDROOM-FLOOR PLANS, CORRIDORS, SERVICE ROOMS

### Typical Bedroom-Floor Plan

The overall plan shapes have already been discussed. The detail planning is mainly dependent on typical bedroom unit or units on each side of main communicating corridors. Bedrooms are the most important matter after main vertical circulations have been agreed. Adjustments to lower floors can generally be made to accommodate the shape and positions of staircases and lifts and main service lines.

Lower floors are more adaptable in planning than the typical bedroom-floor plans.

The typical bedroom-floor planning has to provide space for bedrooms, sitting-rooms, bathrooms, W.C.s and various service rooms, such as linen stores, maids', valets' and waiters' rooms; these are generally arranged within one or two of the standardized units from which the typical floor plan is built up. Special units, or the area of two normal units, may have to be used for suites. The best aspects and prospects must be given to bedrooms in preference to service rooms, bathrooms and staircases. Suites are generally most easily placed at the ends of wings or in corners of floor plans where they do not interrupt the steel grid plans which are based on repetitions of standard or normal bedroom units.

The " bathroom to every bedroom " is a growing demand to be met in new hotels or the rebuilding of older ones. It is, therefore, difficult to discuss fully the bedroom without continual reference to bathrooms.

Opinions vary as to the desirability of internal bathrooms, but great saving in space may usually be effected by their use and more bedrooms can be obtained in a given length of frontage. For hotels where bathrooms are required attached to all bedrooms, internal bathrooms should be considered; except in high-priced hotels and possibly those at the seaside and where site value does not affect the scheme to any great extent, when external bathrooms may be preferred. Artificial ventilation is a most satisfactory method to guarantee adequate and continuous ventilation of bathrooms, as there is no certainty that windows, when provided, will be often open. Artificial ventilation extracts air from the bedroom through the bathroom where it collects steam and passes into a duct; in external bathrooms open windows tend to blow foul air and steam into the bedrooms, unless doors and lobbies are well arranged.

A bathroom to every bedroom does not always prove to be as expensive as may first appear, owing to reduction of staff work; apart altogether from the convenience and privacy for guests. Lavatory basins in bedrooms also save staff work, if the expense of providing baths and W.C.s attached to each bedroom is considered too great, but this is not nearly so satisfactory for guests.

### Corridors

Corridors on bedroom floors are usually 7ft. 6in. wide for main corridors and 6ft. wide for secondary ones. It is general practice to carpet part or the whole of bedroom-corridor floors and the widths should be governed by the normal commercial widths of carpets. When uncarpeted borders are used, these may be of wood, terrazzo or marble, of such thicknesses as to be level with the carpet in the central part, as the latter is generally laid directly on screeding and a thick underfelt. Borders are sometimes used as covers to pipe and wiring ducts, an arrangement giving great ease of access; the covers are laid in short lengths, and fixed into place with screws for quick removal. Frequently corridors are not made the full height of bedrooms in order to provide continuous duct spaces for various services, such as electricity, telephones, ventilation, etc. Many hotels have a fanlight fixed over every bedroom door in order to assist the ventilation of the corridors and rooms, and more particularly to ventilate bedroom entrance lobbies, which are sometimes entirely enclosed; fanlights have the disadvantage, however, of permitting noise from corridors to penetrate to the rooms, more especially when entrance lobbies to bedrooms are not used or fanlights are placed over both bedroom and corridor doors in the same entrance lobby.

### Service Rooms

Every bedroom floor should be equipped with one or more of each of the following rooms according to the number of bedrooms on each floor:—Linen store, furniture store, maids' store and slop-sink, and in better-grade hotels a food service room and valets' room. Bedroom-linen stores are supplied from main linen rooms, generally in the basement, from day to day according to the number of guests vacating rooms. These linen stores are frequently artificially lighted, and may be in dark corners of a typical floor plan. They should be ventilated and heated; should generally be not less than 5ft. by 4ft. and should be fitted with slatted shelves at least 24in. deep to carry folded sheets, towels and blankets.

It is more satisfactory to store linen in a separate apartment than in a cupboard in a room used for other purposes, such as the sink room (unless the maids share the valets' service room), owing to the likelihood of steam from hot taps penetrating to the linen.

There should be a room on each bedroom floor in which the floor maid on duty can sit with reasonable comfort; it should have adequate daylight and ventilation. In some hotels, where food service on bedroom floors is unimportant, except for early morning tea and breakfast, the maids use the service room, while the slop pantry is artificially ventilated and used only for its own purposes and the storage of cleaning supplies; in hotels of lower-price grades the maids' pantry, store and food-service room are often combined. In better-class hotels the maids' pantry and store may be combined or separate, but the maid on duty uses the pantry, which is made rather larger than the minimum required for slop-sink, storage of service trolley, etc.

Pantries should have the fittings well placed, with adequate shelves and containers for stores such as dusters, soap, brushes, cleaning materials and china for early morning tea, independent of the main kitchen.

Dirty linen is collected into bedroom-floor linen stores in some hotels, and removed when new supplies are brought up, while others have collecting baskets, which occupy considerable floor area, placed in the pantry. The most satisfactory method of dealing with soiled linen seems to be the installation of chutes connecting directly to a dirty-linen sorting-room in the basement; by this method linen is not stored on the floors, thus saving space and providing a more sanitary arrangement; it also permits sorting to take place at any time during the day instead of at

one rush-time. A further reason in favour of the installation of chutes is the elimination of work for the lifts.

Many hotels, especially those of the luxury class, require a room on each floor to store extra furniture; some guests may want extra tables and chairs, a double bed instead of twin beds, a child's cot, and so on. Such a room should have clear floor space, except that one tier of stout shelving, fixed about 3ft. above the floor, may be placed along one wall to receive smaller articles, such as bedside tables and small chairs, in order to make the maximum use of floor space.

Mattresses are sometimes stored in the furniture-store room, but are better in linen rooms.

In the cheaper type of hotel a waiters' room is generally unnecessary so long as there is lift connection to the kitchen level from the maids' pantry; in the middle-priced group a small service room, at least on alternate floors, is required, while the higher-priced and luxury groups require a large and well-equipped service kitchen on every bedroom floor.

Service rooms must provide a sink, draining-board, facilities for boiling water for tea and coffee, making toast and cutting bread and butter. China and silver are, in many hotels, kept on the floors on which they are used, therefore china-storage cupboards and washing and cleaning facilities are essential, unless direct service from the kitchen is provided.

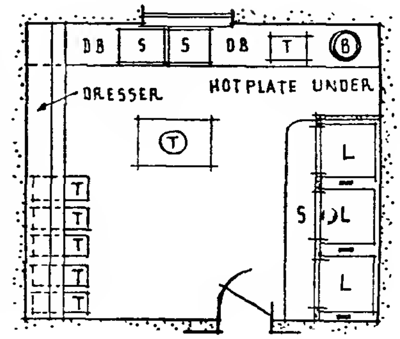



Fig. 10 Bedroom-service pantry

### Bedroom Food-Service

The amount of service required on bedroom floors varies greatly; in cheaper grades it amounts only to service of early morning tea and occasional breakfasts; in middle grades more breakfasts are served and also afternoon teas; whereas in luxury hotels, which have some sitting-rooms on each floor, many meals are taken in rooms and complete lunches and dinners have to be served.

There are two main methods of serving food in bedrooms: first, service rooms on each or alternate floors connected to the kitchens by lifts, and, secondly, by serving directly from the kitchen, a waiter bringing a prepared trolley by lift from kitchen to bedroom or sitting-room.

Both these methods appear to cause complaints from guests as to the state of the food on arrival. The difficulty of having the service room on each floor is that two persons are necessary to produce satisfactory service, one to take orders, pass them on to the kitchen and receive and empty the lift from the kitchen, and the other serving in the rooms. In the " direct-from-the-kitchen " method, the person receives orders by telephone from the guest; the amount of labour needed is thus diminished. On the other hand, there is apt to be confusion among waiters leaving the kitchen who jostle for turns at lifts, unless there are several lifts available; this method does, however, appear to produce more rapid service and probably conveys food in a better state.

### Bedrooms

There has been a tendency in recent years to reduce bedroom sizes, even below the sizes necessary for comfort and to accommodate essential furniture. The increased use of built-in furniture and fitments has helped to make possible this reduction in free floor area. A number of hotels now work on the principle of making nearly all rooms large enough to be used as double bedrooms; the double bed is rapidly dying out in favour of two single beds.

These two points are of importance in early planning. The extra area required for a two-bed room is very small compared to that needed for two single-bed rooms and often two friends will share a two-bed room who would not share a double bed; the total number of guests who can be accommodated in times of pressure is thus increased.

Bathrooms, if not planned as part of the bedroom unit as is necessary if they are definitely attached to one or two rooms, may be grouped together in easily accessible places on each floor or may be placed so that one or two bathrooms serve a group of rooms. If bathrooms are not attached to particular rooms or groups not exceeding two bedrooms, W.C.s should always be separated.

### Bedroom Sizes

The smallest desirable hotel bedroom is 12ft. by 8ft., or 96sq. ft.; this is only suitable for single rooms in lowest-price grades and for general purposes the smallest room should be about 9ft. by 15ft., in which it is possible to place a double bed or two single beds, but only with little free space. Good sizes for double bedrooms are as follows: Good second-class hotel, 11ft. by 15ft. = 165sq. ft.; ordinary first-class hotel, 12ft. by 18ft. 6in. = 222sq. ft. good first-class hotel, 14ft. by 18ft. 6in. =259sq. ft.

Opinions on room sizes vary enormously among hotel managers, but basic sizes must be mainly dependent on the furniture to be put in the rooms, a fairly constant factor in each price grade.

It is important to design bedroom units on a simple steel grid so that single and double rooms may fit standardized stanchion spacing.

Fig. 11 illustrates a steel grid which allows various arrangements of rooms retaining a steel bay width of 10ft. The 10ft. width is used for a single bedroom, for two bathrooms and two entrance lobbies and three similar bays for two double bedrooms. The positions of the partitions are adjustable inside the steel plan, thus making up any arrangement of rooms desired. Similar methods may be worked out for varying sizes of grid.

Fig. 12 illustrates the comparative areas occupied by bedroom and bathroom units where the bedrooms are of the same area, 120sq. ft., the bathroom being placed internally in Type A and externally in Type B.

Type A requires 12ft. frontage per room and Type B 15ft. 6in. frontage.

## BEDROOMS

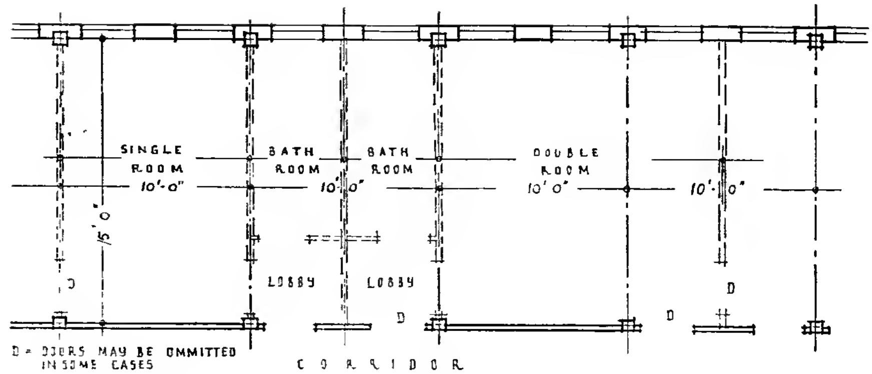
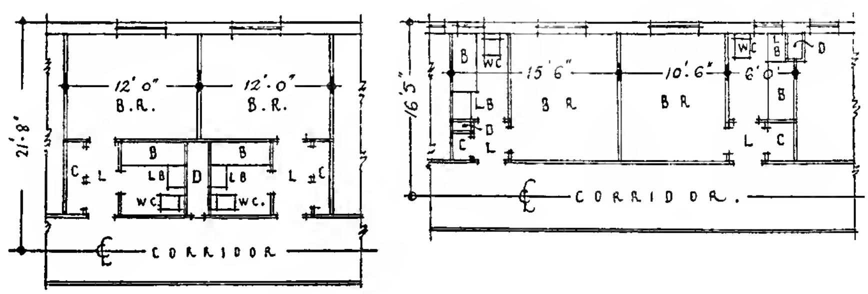



Fig. 11 Adaptation of a standard steel grid to various bedroom requirements




A 260sq. ft. B 254sq. ft. 270sq. ft. C

Fig. 12 Internal versus external bathrooms

The depth required from the outside wall to the centre line of the corridor of a wing is 21ft. 8in. for Type A and 16ft. 5in. for Type B. The approximate total areas required are very little different, being 260sq. ft. in Type A and 254sq. ft. in Type B, or 270sq. ft. in Type C, which has a wider bathroom than Type B. The important factor is, however, that Type A gives slightly over 8 units per 100ft. of frontage, against about 6½ units in Type B, which affects many schemes very considerably, although in the internal-bathroom type the extra cost of artificial ventilation is also involved. By the elimination of the cupboards in the entrance lobbies to the bedrooms and by turning the rooms so that the longest dimension is at right angles to the window wall, as shown in Fig. 13, Type B, there is a still further gain in frontage. The advantage of the bathroom in Type C over that shown in Type B in Fig. 12 is that the fittings may be arranged better and the pipe duct placed on the external wall, which presents fewer difficulties below the lowest bedroom floor, where pipes have to pass through main public rooms without interfering with the layout of the latter. Bathrooms are frequently built with the ceiling height at a lower level than the adjoining bedrooms in order to conceal the plumbing as much as possible and by having loose panels in the ceilings the suspended plumbing may be made easily accessible.

Fig. 13 illustrates two further plan arrangements for internally artificially ventilated bathrooms, of which Type B is more generally adopted in congested sites to economize in frontage. Type A has one external and one internal bathroom placed on each side of a pipe duct; both these rooms are approached directly from the bedrooms, which do not have entrance lobbies from the corridors. Type A also tends to make the room somewhat congested when the furniture is in position, due to the extra bathroom door and to the absence of built-in hanging cupboards. Type B has both bathrooms adjoining the corridor: each is entered from a cut-off lobby acting as a noise and ventilation buffer between the bedroom and the bathroom and corridor. As bedroom and corridor doors are opposite each other the passageway may be reduced somewhat, leaving space for two cupboards side by side, one for the use of each of two adjoining rooms. In larger-sized rooms of Type B it is quite usual to place a continuous fitment of shelves, trays, and hanging space the full length of the wall separating the room from the bathroom.

Fig. 14 illustrates bedroom and bathroom units incorporating a dressing-room; units such as these are only applicable to hotels of luxury class or to a few suites in high-grade hotels. The two types shown have practically the same accommodation, but in Type A the bathroom is placed externally and the dressing-room internally, whereas in Type B the positions are reversed in order to provide daylight in the dressing-room; the latter is the most desirable arrangement. This type would need bedrooms about 18ft. by 12ft. 6in., there being plenty of space in this length for both the bathroom and a small dressing-room. Type B also has the advantage that the dressing-room not only has daylight but also acts as a cut-off between the bathroom and the bedroom and, in addition, as the bathroom is artificially ventilated, the air is extracted through the dressing-room, thus eliminating the risk of steam being blown by an open window into the dressing-room and ultimately into the bedroom as might happen in Type A. The dressing-room, if considered to be too small, may be increased in area by throwing the entrance lobby into the area occupied by the bathroom and dressing-room and by approaching the room directly from the corridor, although this is not particularly desirable in hotel suites of this class.

Equipment of bedrooms varies according to hotel charges. It is general, except in the very cheapest grades, to provide central heating in all bedrooms; the only other exceptions being hotels at seaside or in similar situations, if only occupied in the summer months; but even in these unless the season is very short, central heating is often a desirable feature and, in addition, has

its usefulness in keeping the building in good condition during the months when it is closed. Radiators in each room must be controllable by the guest, as temperature requirements vary; it is also important that heating surfaces should be such that changes of temperature are obtainable rapidly.

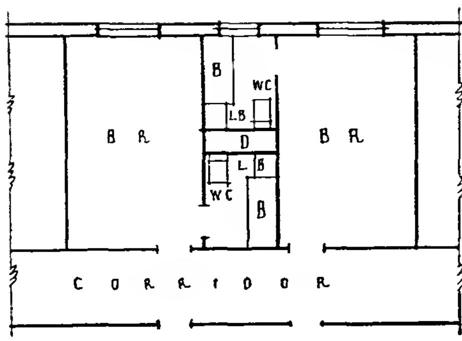
The provision of lavatory basins in all bedrooms, even those with bathrooms attached, has become general in all grades of hotels, not only for the obvious convenience to guests but also because of the great saving in labour.

An adequate number of lighting points is required, properly placed and switched in relation to dressing-table, lavatory basin, and bed-head, as well as for general lighting of the room. In all grades of hotel at least two lights are necessary, one to light the room, more particularly dressing-table and shaving mirror and the other for the bed, the latter being controlled from the bed.

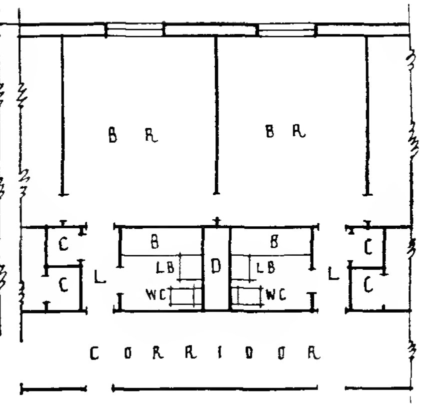
Secondary heating, in addition to central heating, is essential in sitting-rooms and in bedrooms of all better-grade hotels. In hotels without central heating, gas or electric fires are generally installed with coin slot-meters attached so that the guests need only pay for fuel while in the room.

Other equipment of bedrooms may be more strictly termed furnishing, but, as much is now built in, it becomes part of the planned building. Built-in fitments vary considerably in number, type and size; wardrobes in small hotels are small, simple, and cheaply produced, but in other grades have become large and elaborate pieces of equipment. Other furniture, sometimes built-in, comprises dressing-tables, bed-head fitments and window seats.

In most hotels close carpeting of floors has become general practice; this eliminates other forms of floor finishes, since carpets are laid on thick felt directly on a screed over the structural

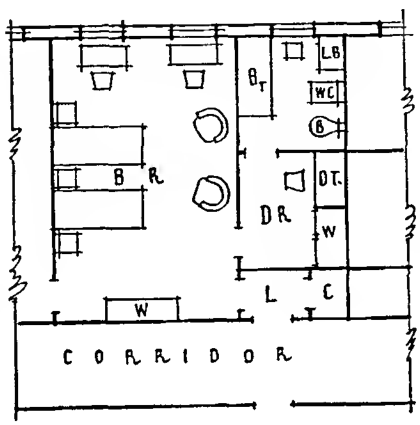



A

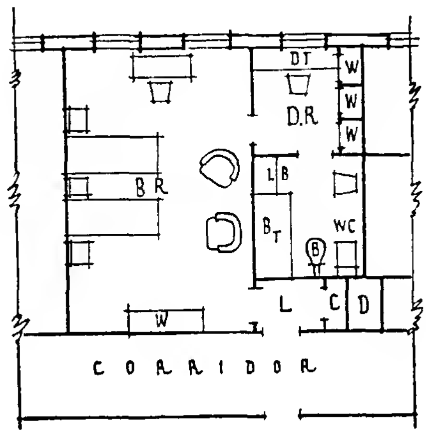



B

Fig. 13 Internal bathrooms




A External bathroom




B Internal bathroom

Fig. 14 Layout of luxury bedroom units

floor. Cheaper-grade hotels unable to bear the cost of close-carpeted floors use polished floors and one or two small rugs; but the cost is very similar if moderately good flooring timbers are used. An alternative is linoleum laid on concrete but this is hard, cold and noisy.

Bathroom equipment usually consists of bath, basin, towel rail, and W.C., and in higher-grade hotels the bidet is becoming usual. Shower-baths are not often provided as separate fittings in this country; but better-class hotels have a shower over the baths. The shower-bath only, with a basin and W.C., is fairly common in American hotels of commercial and lower grades; such bathrooms show a saving in space over those with tub baths, but little saving in upkeep, especially in consumption of hot water.

## LOUNGES

### Main Lounge

This may take the form of a corridor room from which other public rooms are approached, or of a room completely cut off. The first type seems general in hotels where guests do not stay for long periods, while the second type is more usual in residential and resort hotels. In both types there are, of course, other suitably placed public rooms. The first type may be of any shape, but should not be so narrow as to assume the nature of a rather wide corridor, this being very difficult to furnish comfortably. Lounges in luxury hotels are general meeting-places, mainly for the use of casual visitors, especially at tea-time, and form ante-rooms to restaurants at lunch and dinner times. In residential and resort hotels guests use a main lounge much more as a common meeting-place; it should, therefore, have a larger area in relation to the number of guests than the lounge of an hotel used mainly by transient guests.

Figs. 15, 16 and 17 illustrate various types of plan; in addition there is a common American type which provides a rather vast space called " the lobby," which is a central circulation space around which are placed the office, lifts and public rooms; it is usually two stories in height, the upper floor forming a gallery round a large well, this gallery being reserved as a lounge and a writing-place for the use of guests sleeping at the hotel. This two-storied " lobby " of the American plan is often the only public space other than restaurants.

Fig. 16 illustrates the wide corridor type of lounge from which all main rooms are approached. Doors are provided leading directly to service units so that adequate waiter service is provided to all parts.

Fig. 15 shows a different type, in which the main lounge is again an access space serving the restaurant, ball-room, etc., but is more definitely a room as opposed to the corridor type in Fig. 16. It becomes more of a lounge and less an ante-room than the corridor type. This central or internal type is frequently top-lit.

Fig. 17 shows a plan typical of a large number of hotels of all types, particularly of the seaside and semi-residential kind. The main lounge is a large room, or series of rooms, completely cut off from corridors and

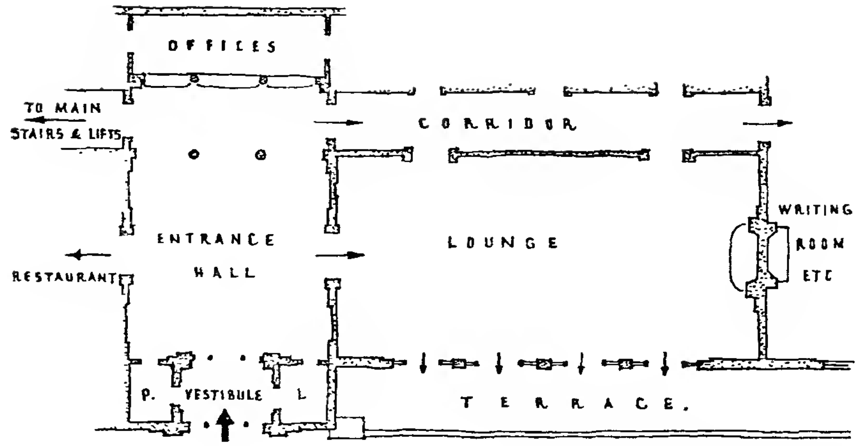



Fig. 15 Lounges: the room type

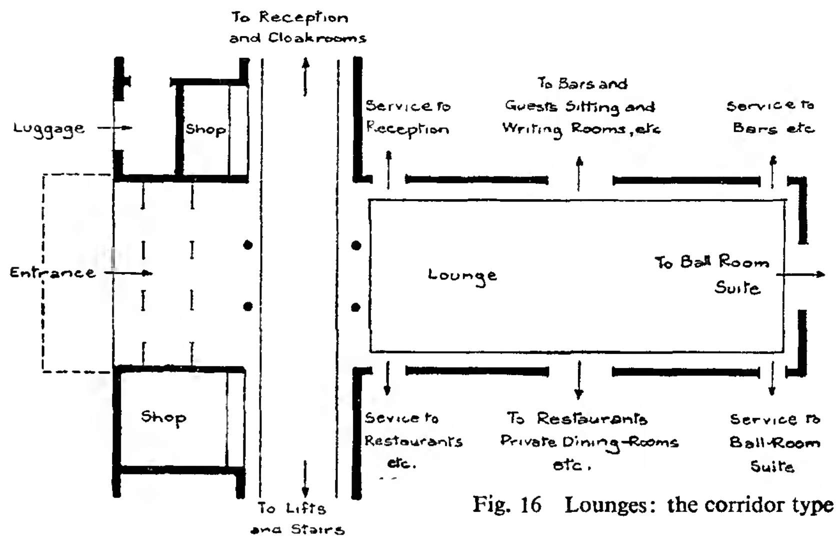



Fig. 16 Lounges: the corridor type

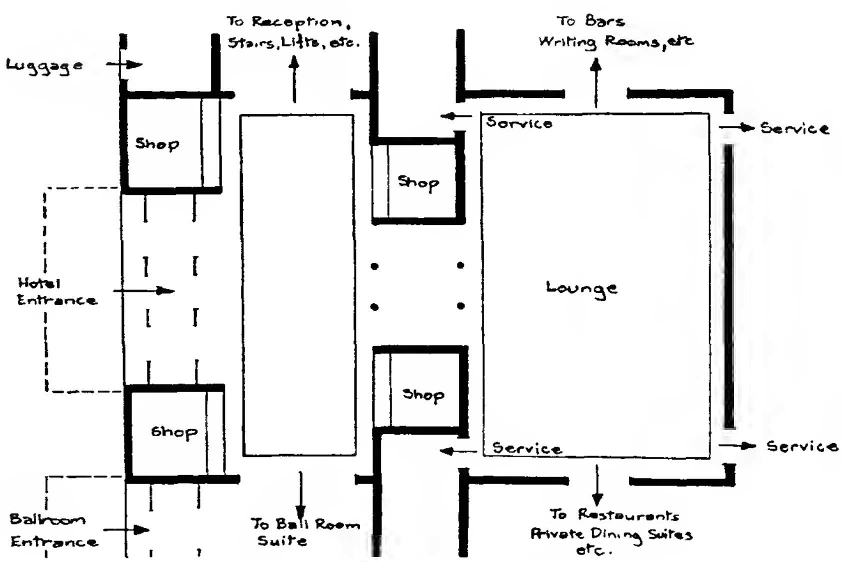



Fig. 17 Lounges: the internal type

entrance hall, and is therefore not an access or passage room. Main lounges of this type often have an open fire, introduced as a central feature of the decorative scheme, though it may be of no value from the point of view of heating so large a room.

The decoration of main lounges of this type should be more or less domestic in character, whereas in the first two types the domestic atmosphere is less desirable. In seaside and country hotels good aspect and prospect are essential features for main lounges; direct access to gardens or terraces is not always so much appreciated as might be imagined, as it tends to make rooms draughty and uncomfortable, particularly in rough weather at the seaside. Moreover, guests entering directly into rooms without passing through lobbies create unnecessary and disturbing traffic through the room.

Commercial hotels also require a fairly large entrance lounge though it does not need to be so large as in the types already discussed. This type of hotel also needs especially large writing-rooms and these may often be provided by reducing the size of the central lounge.

A point of planning which has not been carried far in this country, although increasing in other countries, is the placing of the public rooms on the first floor, particularly on city sites where the frontages at street level are of great value for shop purposes. Any increase in building heights which is allowed in this country will lead to a change in this matter and probably mean a closer approach to American practice.

An hotel with first-floor lounges may have main and secondary entrances only on street level, with shops on all or some of the street frontages. Alternatively the main frontage may be occupied by shops and main hotel entrance and the rest of the site by a restaurant or grill-room in general use by the outside public, together with secondary and service entrances. The main lounge in this type of plan often occupies a large part of the main frontage at first floor level.

It is impossible to give any definite information as to areas for lounges, but they should be as large as the conditions of the site will allow after providing for restaurants and service. Lounges are not, from the hotel-keeper's point of view, very profitable, except when they are likely to be used to a considerable extent for the service of drinks, teas, etc. Some form of ante-room or lounge, having bar service, is essential (and generally profitable) and should be attached to all restaurants for casual visitors. But in the hotels of the "quieter" types, especially in resort towns, many guests prefer all bars to be separated entirely from the main lounge, which then becomes essentially the main sitting- and reading-room.

It is not proposed to discuss the merits of the service of alcohol in lounges as opposed to bars from the point of view of obtaining licences and meeting the views of licensing benches, but it does seem that all good-class hotels, other than temperance hotels, should provide for service in lounges whenever possible, mainly for the benefit of women guests, many of whom are disinclined to use separate bars. In commercial hotels a separate bar or bar lounge is desirable, in addition to a main lounge.

The furnishing of lounges should consist of really comfortable easy chairs and settees, and plenty of tables, but in addition some ordinary armchairs are generally needed, especially if the rooms are used for the service of drinks and teas.

### Drawing-rooms

A "drawing-room" is still provided in a number of hotels, particularly quieter and more residential types; this room is mainly used by women guests as a quiet sitting-room and, in some hotels, is even limited to their exclusive use. The size of the room depends mainly on the space available; its decorations and furnishing should be simple and comfortable. The need for such a room in a new hotel is somewhat doubtful, and a smaller general lounge separate from the main lounge would probably be more useful.

The drawing-room should be on the same floor level as the remainder of the public rooms if space permits, but if there does not appear to be any great objection it may be placed on the floor above the main public rooms, provided it is near lifts and staircase. The outlook from the windows should be as pleasant as possible, and a southern or westerly aspect is to be preferred in seaside and country hotels.

### Children's Room

Some hotels provide a special children's room. It should be a large room, and so placed that any noise from it does not disturb the remainder of the hotel. Special lavatory accommodation is desirable adjoining this room. The decoration and furniture should be gay and cheerful and designed for rough usage.

In seaside hotels the children's room has, in many instances, developed into a games room for the use of younger guests (in addition to the children) in wet weather, where games such as table tennis, etc., may be played without the necessity of making temporary arrangements in sun lounges, ball-rooms, etc. Odd-shaped rooms on any floor level may be used, so long as fairly good light and air are available.

### Writing-room

In nearly all hotels, regardless of size and type, some form of writing-room is essential. In luxury types only a small room is necessary, as writing facilities for most of the guests are provided in the individual bedrooms. In hotels mainly patronized by business guests, such as railway hotels and hotels in large cities and in those catering particularly for commercial travellers, the writing-room is very important. The room is also used, as a general rule, as a quiet reading-room where conversation is practically forbidden and thus the floor area adjoining the windows may be used for writing tables while the central part can be furnished with chairs suitable for reading. There are two main ways in which the writing-tables may be arranged: one is with the writer facing the wall and the other is with the tables placed at right angles to the walls. More writing-accommodation can usually be provided if the latter is adopted and in this type two writing-tables are often placed back to back so that the writers face one another: an arrangement which is undesirable unless a screen is used. This screen is not very pleasant in appearance unless carefully designed.

Writing-tables should be at least 2ft. 9in. long per person and at least 18in. wide, exclusive of any fitting for stationery which may be placed on the table top.

## WRITING-ROOMS, SMOKING-ROOMS, SUN LOUNGES

Fig. 18 illustrates the two types of layout of tables in the writing-room. The only contentious point is whether the tables should be placed in front of the windows or between them; if in front, it is difficult to reach the windows and the view out is blocked to persons seated in chairs in the remainder of the room; but in the alternative type the light on the tables, if they are placed facing the wall, is unsatisfactory. Adequate and proper artificial light at writing tables, in addition to the general lighting of the room, is essential, and should receive careful attention.

The room should be decorated and furnished in a quiet, restful manner and should be heavily carpeted to reduce noise of people entering the room. It is preferable that the room be on the ground-floor level, and should only be placed on the first floor if there are other public rooms on the same floor level, such as a small lounge or the drawing-room. The room does not need to be as high as main lounges, but good daylight is essential and, whenever possible, a pleasant outlook, although this is not of such importance as in main lounges and, in the case of resort hotels, main restaurants.

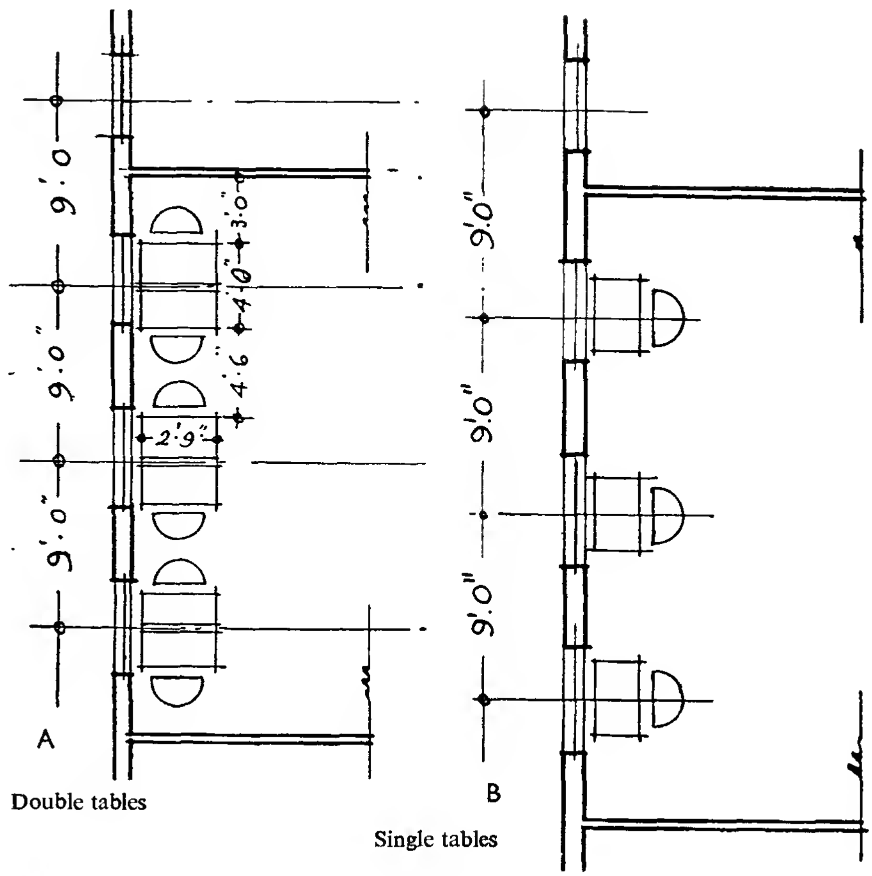



Fig. 18 Writing-rooms

### Smoking-rooms

It is seldom, except in residential hotels, that a separate smoking-room is provided, unless the designation is used to disguise a general lounge or bar lounge reserved exclusively for male visitors.

### Sun Lounges

Seaside and resort hotels usually need open-air or partially enclosed sun lounges, either on ground-floor level or, in some instances, on roofs. They should be capable of partial or complete enclosure, as a protection against wind, by glazed movable screens; they should also, if possible, look out on to terraces or gardens.

Balconies or terraces covered by awnings are also appreciated by guests when attached to restaurants or lounges in town or city hotels, if they have a suitable outlook over gardens or parks. Care must be taken, however, that awnings neither cut off the view from tables or seats in the main room which they adjoin, nor cut off too much daylight so that artificial light has to be used in daytime.

### Roof Gardens

Some hotels have made use of roof spaces for summer lounges or restaurants, more especially in large cities where such spaces have fine views. The difficulty is to provide roof spaces clear of obstructions, such as chimneys, tank rooms, fan casings, etc., and with adequate passenger- and food-lift services, without disturbing the occupants of intervening floors by such use.

A further difficulty in this country are the height limits imposed by by-laws.

### Balconies

Guests at seaside and resort hotels appreciate balconies attached to bedrooms, completely cut off from those used by adjoining rooms; this raises a rather difficult problem. Individual balconies to each room are costly to construct, while divisions are unsightly on long continuous balconies. When balconies are provided it is essential that they project sufficiently to provide an adequate area for the swing of the doors in addition to the area necessary for one or more deck or similar chairs, according to the number of occupants of the room. Deck chairs with leg rests require a space of about 6ft. by 2ft.

## Food-service Rooms

Service of food may be required in one or more rooms of a hotel. It will be found that complicated planning is involved when a number of rooms has to be served. The food is stored, cooked and handled in one main kitchen, connected to rooms in which guests eat by means of service rooms either attached to the kitchen itself, or in many instances placed some considerable distance away. The core of all planning for food service must therefore be between the main kitchen and those rooms requiring the largest or most frequent service which should be placed as near to the kitchen as possible. Restaurants, main dining-rooms and grill-rooms should be situated nearer to the kitchen than banqueting-rooms or rooms such as tea lounges, in which meals are only required during short fixed periods of the day.

A hotel dining-room may be in use from very early in the day until late at night and similar service is often needed for grill-rooms.

Fig. 19 attempts to illustrate diagrammatically the basic layout of food service for a moderately large hotel. Such a hotel caters for a considerable outside business, but does not have dancing or similar evening entertainments. Hotel guests use both the restaurant and the grill-room for lunch and dinner; the grill-room serving meals at all times from noon until midnight, and the restaurant being used at breakfast time and for fixed periods at midday and for dinner.

The main flow for food service is from goods entrance through the receiving room to stores and larders, through preparation departments into the kitchen or directly to service rooms, as necessary. Garbage and rubbish return to the goods entrance, whence they are removed. Attached to the kitchen is a wash-up for utensils. Prepared food passes from kitchen through a service space, which may either be part of the kitchen itself, or may consist of one or more separate service rooms attached to the various dining-rooms. This service space, however arranged, is for prepared food served to dining-room, grill-room, bedrooms, banqueting-rooms and private dining-rooms.

In an hotel of this character, the service which handles bedroom breakfasts may be used for the remainder of the day to deal with private dining-rooms and banqueting-rooms. It is now usual to do all washing-up in one general wash-up attached to the main service kitchen, except in some cases when certain special china or glass may be retained and washed up in separate departmental services in which it is used.

A wine dispense has to serve all the various rooms and is itself fed from the cellars, which are supplied *via* the receiving room. The wine and spirit dispense is usually attached to the main service, but sometimes a secondary dispense is attached to banquet or other rooms when they are located far from the main dispense. Bars are stocked from the dispense or cellars before opening hours.

The seating capacity for hotels in the food rooms in regular use should exceed considerably the sleeping capacity of the hotel. Residential hotels and resort hotels for which little outside business is available, should have restaurant seating capacity for all the guests at one time, as in such hotels guests retain their tables throughout stays and also meals are served only during a limited period between certain fixed hours. Hotels serving a travelling public should have, for preference, two rooms for meals, especially if commercial travellers are to be catered for.

The floor areas required for food service vary according to the type of hotel, the type of catering, patronage, etc. The minimum should be, however, a dining capacity for at least the number of persons for whom sleeping accommodation is provided, while the service space required to deal with dining capacity will vary from about 50 per cent to 100 per cent of the area of the dining-rooms, inclusive of kitchens, stores, staff rooms and other dependencies.

The layout of dining-rooms and kitchen to be preferred is to have the restaurant adjoining the kitchen and on the same level, so that waiters enter the kitchen without a service room; this arrangement makes for easy and quick service as there are neither steps nor lifts to become congested and orders are given direct to the kitchen without having to be handled through a service room. A layout of this type is used where the number of rooms to

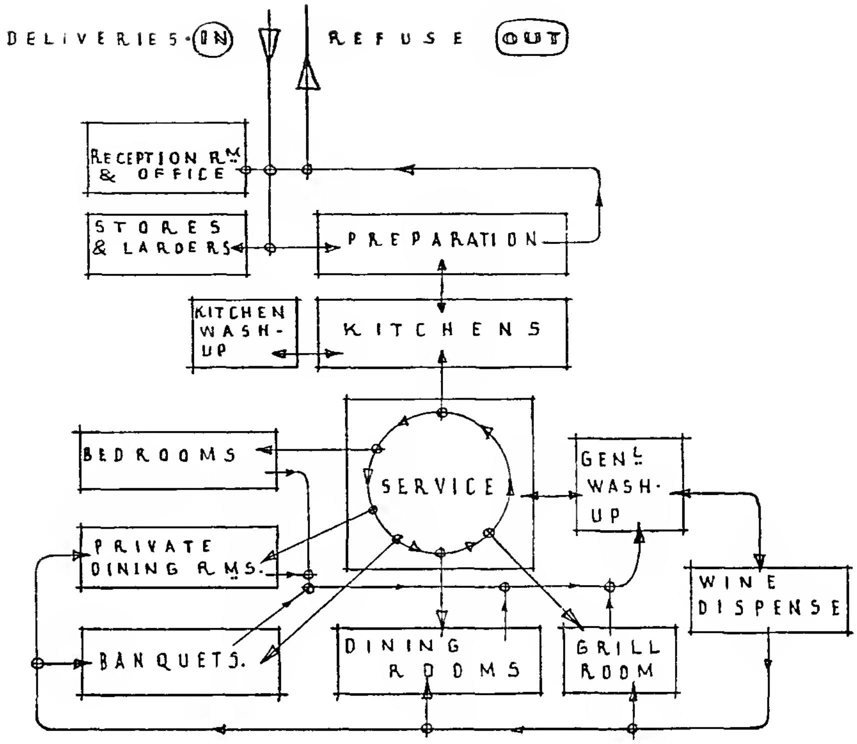
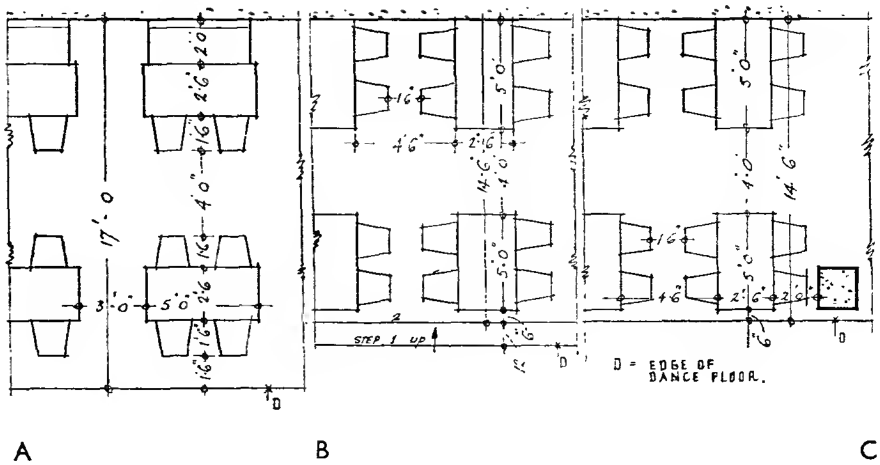



Fig. 19 Food-service organization

be served is small and arranged conveniently round the kitchen.

When the rooms requiring service cannot be on the same level, one of several methods may be used; first, to place the kitchen on the same level as the room requiring the most continuous service with the remainder of the rooms at other levels; secondly, to place the kitchen at a half level between two floors, on each of which are restaurants; or, thirdly, to have the kitchen on a different level from that of the rooms and to connect up by means of lifts or staircases, or both. When there is much *à la carte* service required, it is better for waiters to go themselves to the kitchen by means of staircases as previously described.




Parallel tables — Tables at right angles — Tables between piers

Fig. 20 Layout of terrace-type seating

### Restaurants

The layout of restaurants should be related to the entrances and exits to the service room or kitchen. A survey of existing restaurants shows that almost any shape may be adopted, but there seems little doubt that a long rectangular room, with service doors placed on one of the long sides, is the most economical shape for table layout and for reduction of time taken and disturbance caused by waiters coming and going. A square shape is also good, but does not, as a general rule, lend itself to satisfactory planning of the remainder of the building in which it is placed; this is particularly true if the room is large.

In practice it may be difficult to place the service entrances centrally on walls if several dining-rooms of various types are grouped round one servery or kitchen; but every effort should be made to avoid service doors situated near the corner of rooms, as some waiters then have long walks which make for slow service; guests at the tables near the doors are, moreover, unfairly disturbed by service traffic. Entrance and exit doors should not be placed too close to each other; though it is better if one ample passageway serves for both directions.

It is an advantage to have the whole of the restaurant floor space clear of piers or columns. A single row of columns placed centrally, or nearly so, in the room is bad, although there are examples where this has been done. When piers or columns have to be introduced they should be so placed

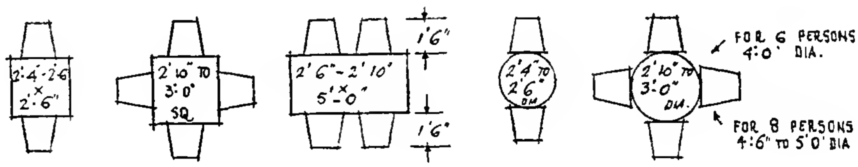



Fig. 21 Data for restaurant seating

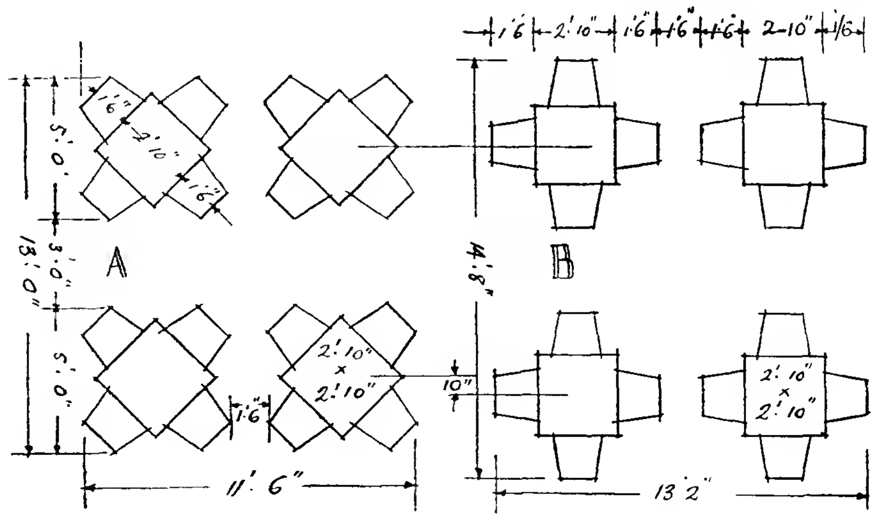



Fig. 22 Data for restaurant-table spacing

in relation to walls that table layout is economical; alternatively the columns may be used to form bays or alcoves with or without fixed seats. Upper balconies are sometimes introduced in restaurants, but it does not seem the general practice in hotel restaurants, as the floor area involved in the well so formed is too valuable. On the other hand, low ceilings in relation to the size of the room should be avoided in all restaurants.

Floors, if possible, should be level, to assist service, as it is so much more difficult for waiters to move about with loaded trays if steps are introduced; but there is little doubt that the type of restaurant which has a raised terrace around the room is attractive in appearance and has definite advantages in restaurants in which dance floors are included, or cabaret performances given. If raised terraces are introduced, their width should be determined with reference to table sizes and layout, in order not to waste floor space, or, on the other hand, to cramp the guests in such a way that service is difficult to some of the seats.

Fig. 20 illustrates the minimum width of terraces and the minimum width which should be allowed between a wall and a row of columns placed parallel to it. It is obviously a waste of space if fewer than two rows of tables are used, one on each side of the service and approach gangway. The difference in width required by two methods of table layout is clearly shown on the figure by comparing Diagrams A and B. Type A requires more space and has several faults, although it is a layout frequently adopted. Its main faults are difficulty of service to seats against the wall and the step of the terrace, and the necessity of having sufficient space behind the chairs and the terrace step. Diagram C shows that tables cannot be placed with their edges nearer than 2ft. to the faces of columns to allow room to move chairs. When terraces are used it is wise to have protecting rails at the change of level and steps only at gangways; this does, however, reduce the flexibility of seating layout. Gangways, as main approaches both for guests and service, should not be less than 4ft. wide.

These dimensions also apply to mezzanine balconies, with the exception that the tables are sometimes reduced in size to seat two persons each and are placed on one or both sides of the gangway. If mezzanine balconies are used, care should be taken that service doors are not placed near the guests' entrance.

The floor area per person in dining-rooms varies considerably. An analysis of floor areas per seat varies from 10sq. ft. to about 18sq. ft., inclusive of passageways, tables, etc., but 12sq. ft. to 14sq. ft. is a good average. Banquet rooms or tea-room type restaurants may have the area per seat reduced to 8sq. ft. to 10sq. ft.; the latter figure is really the minimum for comfort. Grill-rooms require somewhat less area than main dining-rooms or restaurants.

Figs. 20 and 21 illustrate the main minimum dimensions required for restaurant tables and layout. Easy circulation for waiters is essential, with flexibility of numbers of patrons at tables, so that parties or large families may be accommodated at one table quickly without undue disturbance to the remainder of the room. The latter factor is extremely important in hotel restaurants which have a fairly large outside catering business. Tables vary somewhat in size according to the quality of the service to be provided. The dimensions shown should be taken as the absolute minimum. A variety of sizes is of great importance in hotels, but the greater number of tables is generally needed for one or two guests only, as strangers do not like sharing tables. Circular tables are not popular except for use by parties of five persons or more, but they have the great advantage of being capable of accommodating one more person than the usual number with comparative ease. Circular tables require as much space as rectangular ones, but cannot be placed together to form large tables.

Fig. 22 shows the general spacing of tables; by planning on the diagonal, as in Diagram A, there is a great saving in space over the type of layout shown in Diagram B, or on any other arrangement of tables, each accommodating four persons. The type shown in Diagram B seems to be preferred in rooms used mainly by hotel guests, whereas the first type seems to be preferred in first-class restaurants catering for outside patronage, especially if there is dancing or similar entertainment. There should always be at least 3ft. between backs of chairs if the space is to be used for service and this should be increased to 4ft. minimum for main circulation gangways; 18in. is the minimum space between backs of chairs when service space is not needed. The minimum width for each person is 24in., but this is inadequate for single tables, as it allows very little space for dishes, etc. Tables are usually 30in. high. Special care should be given to the treatment or choice of wall surfaces at table level and the level of chair backs, to avoid damage due to scratching and knocking.

Fixed seating, in the form of wall benches, is not general in hotel dining-rooms, except possibly in a room used almost exclusively as a combined ball-room-restaurant. Fixed seating is generally wasteful of floor area, adds to service difficulties and is not sufficiently flexible to meet variations in the sizes of parties of guests.

An important factor in planning relates to entrance doors for guests; these must be kept well away from doors leading to service rooms, to avoid congestion among waiters and guests. The best position for guest entrances is probably in the wall opposite that with the service doors.

### Screening Service Rooms

The doors from dining-room to service room should be screened, to prevent guests being able to see into the kitchen when seated in the restaurant. There are various methods of arranging this screening, some of which are shown in Fig. 23. Opinions differ as to whether one or two doors should be provided between the room and the service, to form a lobby, eliminating the noise of the service and obstructing vision; two doors do not seem to reduce noise very much more than one door, and present difficulty to waiters passing through with loaded trays Doors should always be hung to open in the direction of the traffic and it is usual to hang them on the assumption that waiters carry trays with the left hand and push the doors with the right hand. Doors should be protected—at least up to the middle rail—with metal sheathing. The scheme shown in Example A is the most satisfactory type, but occupies kitchen space. The screen in Type B must be carefully designed in regard to its length, especially on the right-hand side. Two doors should always be provided, so that the traffic in each direction is separated. The layout of service doors shown in Type C, which is a double-door type, has the objection that doors have to be hung on alternate hands, which is a great disadvantage from the waiter's point of view; moreover, if two waiters are going in one direction at about the same time, both doors are opened together, allowing a clear view of kitchen or service beyond. Type D is somewhat similar to Type A, but it has the advantage that the projection of the screen makes a clear way in each direction near the wall for waiters; alternatively, a row of tables may be placed near the wall, projecting as far, if not farther, than the screen, thus creating an enlarged space near the service doors.

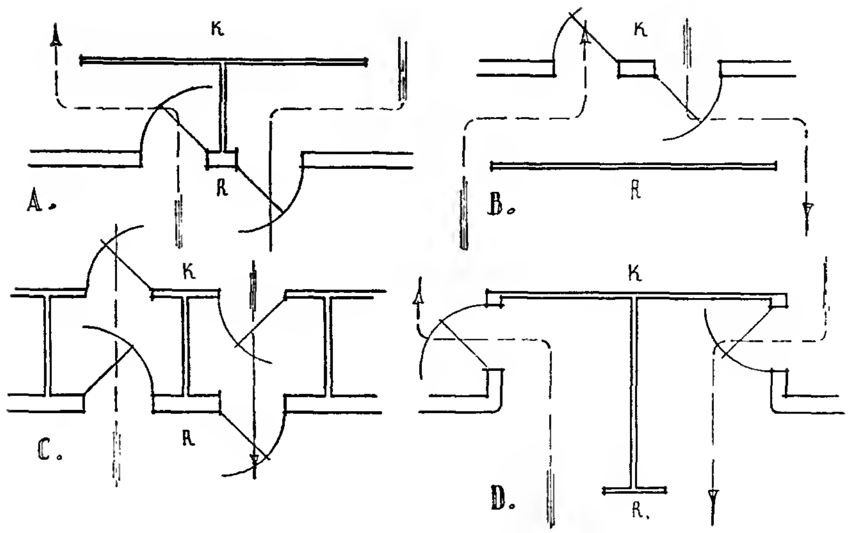
### Dance Floors

Many restaurants and tea lounges have a dance floor for part of the room area. As a general rule, restaurant floors are close-carpeted, but a polished floor is provided under the carpet for use on special occasions. When dancing is a regular feature the area so used may well have a sprung floor, which is locked and covered when not in use. Fig. 24 illustrates two typical tea lounges for seaside-hotel restaurants, planned to accommodate a dance floor, providing, at the same time, good views from the windows. The layout of table spaces shows alternative schemes dependent on the position of entrances. In both examples the long wall has the main view and the band and services are placed on the opposite long wall. The guest entrances, especially in Type B, are separated from the service entrances. An amendment which might be made to these layouts, is to allow room for tables between the edge of the dance floor and the service gangways, to give guests the advantage of sitting near the floor and also to keep waiters from the risk of being knocked by the dancers. Type A is more suitable for the lounge type and Type B more so for a restaurant, but, in either example, windows can be used for access to terraces or gardens. Dance floors should be either square or rectangular, and not less than 20ft. wide in either direction. Circular floors are not generally liked unless they are very large. The position of the dance band does not seem of very great importance, except that it is better at the centre of a side or end and should always adjoin the dance floor itself. The band is often placed in a recess in order to make full use of the back wall as a resonant surface. The band platform is often stepped and should always be raised at least 15in. to 18in. above the general floor level, and should be at least 14ft. wide by 8ft. deep.

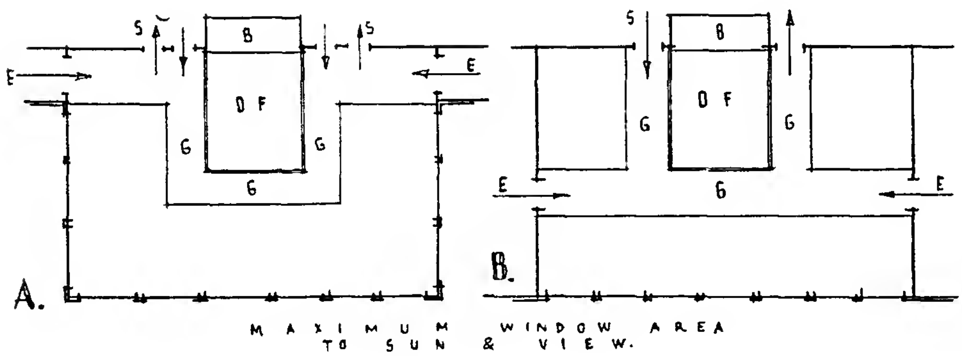
The dance floor and band platform affect considerably the planning of rooms and placing of entrances for guests and waiters, and variations on ideal restaurant layout schemes have to be used, such as the two shown in Fig. 25. Both examples show the main circulations. Type B has advantages over Type A in so far as guests and the service enter on long sides of the room opposite to one another; in Type A the guest entrance generally has to be on one or other long side and the service entrance at the end; if the service entrance is on one of the long sides, the waiters have to walk too far to some tables to give good service. The end position for the service door is thus forced on the designer and this may complicate other food-service planning.

KEY

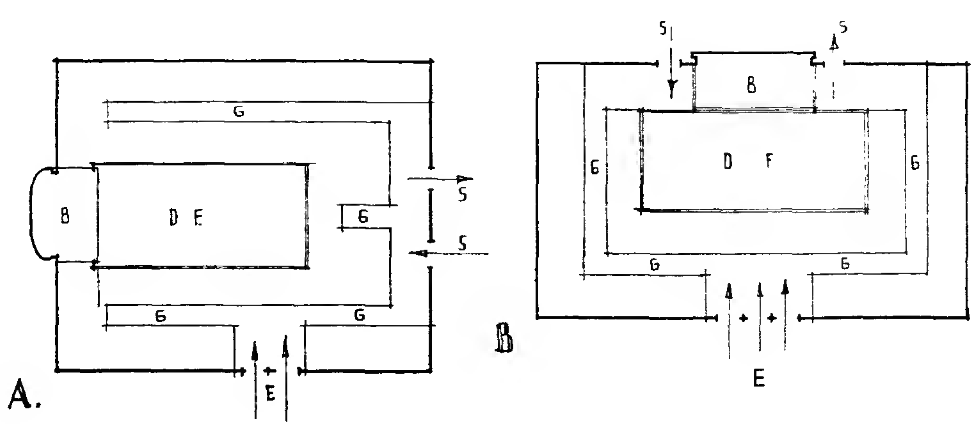
K—kitchen side
R—restaurant
DF—dance floor
E—guests' entrance
G—main gangway
B—band
S—service




Right: Fig. 23 Screening service rooms




Left: Fig. 24 The dance floor




Right: Fig. 25 The dance floor

### General

Many hotels require a large lettable room for general, outside use. This room usually has a number of functions as, for example, a banquet room, a ball-room, wedding receptions and temporary exhibitions. It is desirable that the room be placed on ground-floor or street level, although the basement has been used, with increased ventilation problems. If the room is to be let for uses apart from the hotel proper, a separate entrance is desirable, together with adequate cloakrooms and lavatories for each sex to cater for crowds in short periods. The entrance should be placed so that vehicles can drive up to the door and the pavement should be protected with a marquise or *porte cochère*. At the entrance there should be a vestibule leading into a hall from which the cloakrooms and lavatories are approached. This hall should be fairly large in size, for use as a waiting or reception space. Cloakrooms sometimes present difficulties in finding adequate space for both sexes on the same level as the entrance hall; it is then usual to place men's cloakrooms on a lower floor—either ground floor or basement—and the women's rooms on the upper of the two levels. It is often possible to arrange mezzanine floor levels, as the hall and banquet rooms are usually high rooms and such an arrangement permits cloakrooms one over the other, which simplifies drainage and services. If it is possible it is very advantageous to arrange some large doors or even shutters into the banquet room, for exhibition or display purposes, in order to bring in exhibits even as large as motor-cars.

The size of a ball-room cannot be laid down except on a seating capacity basis for banqueting purposes; such seating is generally more cramped than for a normal dining-room; the space is partly saved by the use of a few large tables instead of many small ones. An average floor space per person in a banquet room is 9sq. ft. to 10sq. ft.

The general shape should be partially dictated by acoustical requirements so that the distance from top-table seats to all parts of the room is equalized; amplified speech, by means of microphones and loudspeakers, can be made to overcome many difficulties, but good initial planning is of the greatest importance. Banquet rooms are generally square or rectangular, the " high "

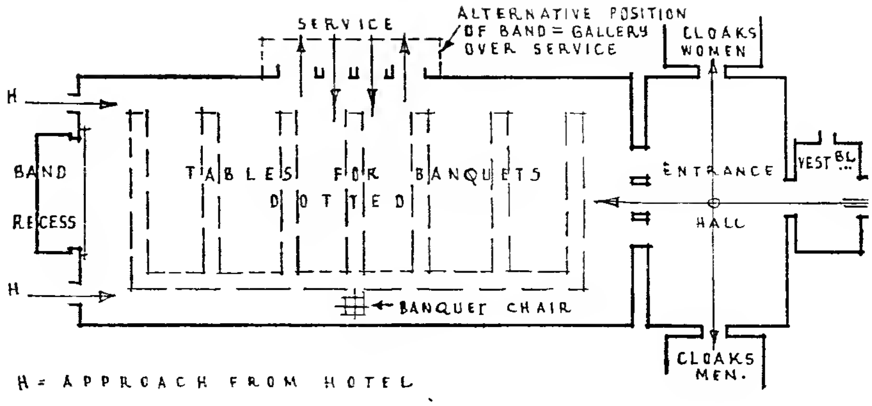



Fig. 26 A typical ball-room layout

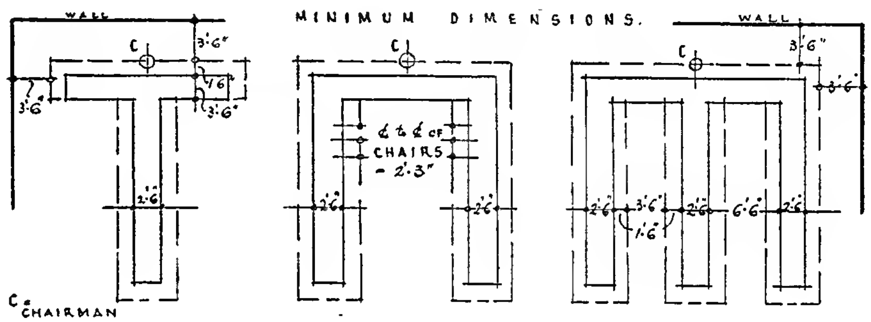



Fig. 27 Banquet seating data

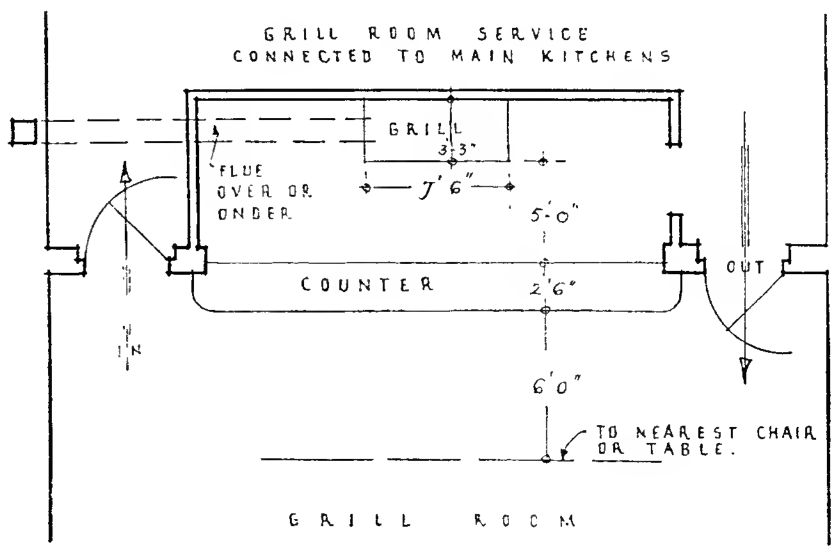



Fig. 28 The grill-room

table being usually against a long side of the room. A gallery is sometimes required, either for use of spectators or for an orchestra. When the room is used as a ball-room, it is general to place the band on a platform only slightly raised above the general floor level, as discussed previously. To find the area required for a fixed number of dancers, an allowance of 10sq. ft. to 16sq. ft. should be made for each couple.

Fig. 26 illustrates diagrammatically a basic layout of a ball-room suite, showing the entrance leading to the hall, from which the cloakrooms open and from which the ball-room is either entered directly or cut off by a small ante-room. In large suites a reception or supper room is often added, which may be approached either from the hall or directly out of the ball-room; a room such as suggested can be a very definite advantage when the room is regularly let out for dances, but is not essential for a ball-room used for dinner-dances or as a banquet room, although reception and waiting space is very useful for banquets. It is better to enter such a room from one end; although this is not ideal, it is almost essential, in order to leave one long side clear for service entrances, which should be, wherever possible, opposite the " high" table. The diagram shows alternative positions for the band, but the one opposite the " high " table is the most satisfactory for dining purposes, and for dancing it is by far the most desirable as the band is apt to be inaudible if at one end of a fairly long room. It is also important to consider the placing of any doors connecting the room to the hotel; these should not be near service entrances and generally have to be at the opposite end to the main street entrance. This entrance to the hotel is often, particularly in resort hotels, just as important as the external entrance.

Fig. 27 illustrates several typical table layouts for banquets; in each example the service is placed opposite the " high " table, so that waiters can enter service gangways without circulating round the room. In a few examples the wine service is separated from the food service, and enters by doors on other walls, or on the same wall as the service doors but completely separate; this is, of course, dependent on the layout of service departments. The figure also shows good dimensions for banquet seating; tables are usually about 2ft. 6in. wide and sometimes up to 3ft.; the seats should be placed at about 2ft. 3in. centres, which may be increased or decreased by 3in. according to numbers to be seated. Gangways should be at least 3ft. 6in. wide to permit of two waiters passing with loaded dishes without difficulty. Wall or main gangways should be wider.

Ample storage space should be available adjoining banquet rooms for storage of tables and chairs. The service room may be used for this purpose if it is only used in conjunction with the banquet room when the latter is used for dining only, but generally it is an unwise procedure, as service may be wanted in the room even when it is used for other purposes. Collapsible tables are usual, and these do not take up much space, but chairs occupy a large volume even when stacked. The storage room must be near, as very rapid changes often have to be made, such as from a wedding reception ending at 5.30 or 6, to a dinner served at 7.30 p.m.

Whatever the use of the room may be, it is usual to provide a polished floor, even if it is often covered, but when dances are likely to be frequent a sprung floor is necessary, for which due allowance must be made in the floor thickness.

Good daylight is not essential in the ball-rooms of urban hotels, as the majority of functions take place after dark, but in resort hotels, especially at the seaside, direct access to terraces, covered lounges and gardens is an attraction which should be planned for whenever possible.

Artificial ventilation is virtually essential in all banquet and ball-rooms to avoid stuffiness and in the former to exhaust smoke rapidly.

**Private Dining-rooms**

Most hotels require at least one room which can be let as a private dining-room for a small party, while in larger hotels several rooms may be required.

When there are several rooms it should be possible to throw them together to make various sized rooms to accommodate parties of different numbers, large folding partitions being used as divisions. The smallest room should not be less than 14ft. by 16ft. The rooms should be arranged in a group, with convenient access to a service room, on the ground or first floor of the building. The rooms are generally carpeted, but the larger ones should also have hardwood floors so that the rooms can be let for small private dances.

**Grill-rooms**

The general arrangement and layout of grill-rooms is similar to dining-rooms. Many hotels have a grill in the room, as the tradition of cooking in the room is still strong, especially in hotels with a large number of male patrons, or in those serving the better classes of commercial travellers. Fig. 28 shows the approximate area required for the grill itself, the working space for the chef and the counter on which are displayed the various foods and under which plates, etc., are stored. The diagram shows the approximate overall dimensions necessary for a reasonably large grill. The layout shown, where the grill is placed between the service doors, works well in practice and keeps all service together at one end of the room; it also connects the grill-space to the kitchen.

## KITCHENS

### General

The detailed planning and equipment of kitchens is a matter too specialized for general planning and it is proposed to confine notes to essential factors only. It should be borne in mind that many kitchens, together with dependent rooms and stores are too small and cramped for efficient service; but equally too great a space causes excessive walking on the part of the staff, which is, in its turn, wasteful of time and energy. The real secret of efficient kitchens is in the layout of equipment and the good quality and selection of the actual plant used.

The best location for the kitchen has already been discussed and, when possible, it should be on the same level as the rooms to be served. But there are certain other factors which should be considered at the same time. Daylight, although desirable, is not necessary in kitchens, especially if it involves loss of wall space which might be used for subsidiary departments or for the placing of apparatus. Daylight can sometimes be provided by placing the kitchen under a light well or open court, but if such a position is chosen care must be taken to guard against the smell of cooking penetrating to bedrooms, or, in fact, any rooms used by the hotel guests: and also to see that noise does not disturb guests whose rooms overlook the area. Sometimes in deciding the location of a kitchen it may be found that space is available on the same floor as the main room to be served, but only at the expense of the loss of revenue from other rooms or possibly shops; the relative merits and rental values must be weighed in order to reach a decision. It is most important not to allow any sort of plan which might spoil restaurant business and affect general returns of the hotel, causing a greater loss than could be made up by the rentals produced by using the space for other purposes. The question of ventilation should not affect the design or the location of the kitchen, as forced ventilation is essential to control the supply of air and the smell of cooking; most engineers dislike any likelihood of natural ventilation of kitchens, because, as a rule, it defeats the ventilation system and causes complaints.

The shape and area required for kitchens and the dependent rooms varies according to the type of hotel and its food service. Large spaces clear of columns, piers and supporting walls, aid the kitchen equipment specialist to produce an efficient layout. It is not essential to have all dependent rooms on the same level, but if divisions of floor level have to be made, the main kitchen, service and preparation rooms must be together. Main bulk stores, staff rooms and independent departments such as the bakehouse, linen, wine cellars, etc., may be separated. The area required for the kitchen proper, for preparation, cooking and service area, exclusive of store rooms, locker and toilet rooms for the staff, varies from 35 per cent to 50 per cent of the aggregate dining-room areas and at least 40 per cent to 45 per cent should be allowed. The smaller figures should only be considered when the meals to be served are mainly table d'hôte and to a limited menu, as is the general practice in many smaller and lower-grade types of hotels; for all hotels where the service has a considerable demand for meals *à la carte* and caters for a large variety of foods, the 50 per cent figure is more likely to be needed. The total area required for the kitchen and all ancillaries is likely to be as much as 100 per cent of the total of the dining-room areas in first-class and luxury hotels.

Fig. 29 illustrates the general basic circulation of food in the kitchen. Food enters and is taken to refrigerators or larders—in the case of perishable food—and to bulk storage for the remainder. It is then passed to preparation and cooking sections, thence to the service counters in kitchen or service rooms adjoining the various dining-rooms. If service space is to be provided in the kitchen at least 6ft. width is necessary, and preferably 10ft. or 12ft. where large numbers of waiters are employed. If staircases are required to other levels they should enter and leave from this same service space.

Such stairs should be at least 3ft. wide or slightly more and the traffic in each direction should be either separated by a handrail and balustrade, or, better still be placed apart in separate positions. The arrangement of departments or sections of the kitchen should be planned to avoid as much cross-traffic as possible and the service counter, which is usually divided into sections for differing purposes, should be laid out in a sequence which best suits the service of the most important room. The service counter consists of hot and cold cupboards, bains-marie, etc., in which food, plates and dishes are kept hot or cold as required; along the counter front there should be a continuous tray shelf on which waiters may rest trays and push them along.

Storage is a very important factor in kitchen layout; it may be divided into two main groups; first, local storage in and adjoining preparation departments and, secondly, main bulk storage of goods of all types. The first type of storage generally consists of shelving, bins and refrigerators, each specially chosen to suit the particular goods to be handled and maintained at varying temperatures to suit each category.

Bulk storage also has to be divided into two main groups; firstly, food which needs either cool storage or refrigeration, such as fish, meat, vegetables and dairy produce, and, secondly, dry, cased or tinned goods which may be placed in large open store rooms fitted with suitable shelving and also with bins.

Shelving should be either of hardwood or metal and the bins of wood, sheet metal or stout wire mesh. Floors should be suitable for moving heavy loads on trucks and should be able to withstand tipping and the dropping of packing cases.

In most hotels the steward's office or goods reception office adjoins the bulk storage, so that all goods are properly weighed and checked on arrival. Large scales are an essential installation. In large hotels an issuing counter is necessary so that only the storekeeper and his assistants enter the actual store rooms, the kitchen porters and cooks collecting from a hatch. The amount of storage space required varies very much with the size of the hotel and its proximity to markets. In larger hotels the refrigeration section may become very large, requiring as many as six rooms—each 70sq. ft. (or more) in area—maintained at different temperatures to suit the type of food kept in each compartment. A central plant is usually used to provide ice requirements and also to cool the various refrigerators throughout the building, with the exception of small independent units in such positions as bedroom-floor service rooms.

## Service Entrance

In small hotels, goods and staff use the same entrance, but in larger hotels there should be separate entrances. Each must be controlled so as to check persons and goods entering and leaving the hotel. If store rooms and entrances are at a lower level than the pavement, adequate-sized lifts, hoists or ramps, the gradients of which are easy, must be installed. Goods lifts must be large enough to carry large packing cases, laundry baskets, sides of meat, etc., on a truck or trolley with a man in charge, and should, therefore, be at least 6ft. by 4ft. in size. Steps and stairs should be eliminated whenever possible in all service departments, slight changes in level being ramped.

Fig. 30 illustrates a typical hotel service entrance in which a backing-in space for vehicles is provided, but not an unloading dock, as in this example it serves also as a staff entrance. The clerk's office controls the unloading space, the parcels room and time clocks. The weighing machine should be placed between the entrance and the goods lift. The staircase to basement is near the lift and is not used to reach the staff rooms, but only the goods stores, boiler room, etc. The staff all have to pass the clocks to reach their locker rooms. A ground-floor receiving department is preferable, although impossible to plan on many sites. The goods entrance should be placed where vans can be within the site boundaries while unloading without interrupting external traffic.

The staff entrance, whether combined with goods entrance or not, should lead directly to locker rooms, passing time-recording clocks and a timekeeper's or paymaster's office.

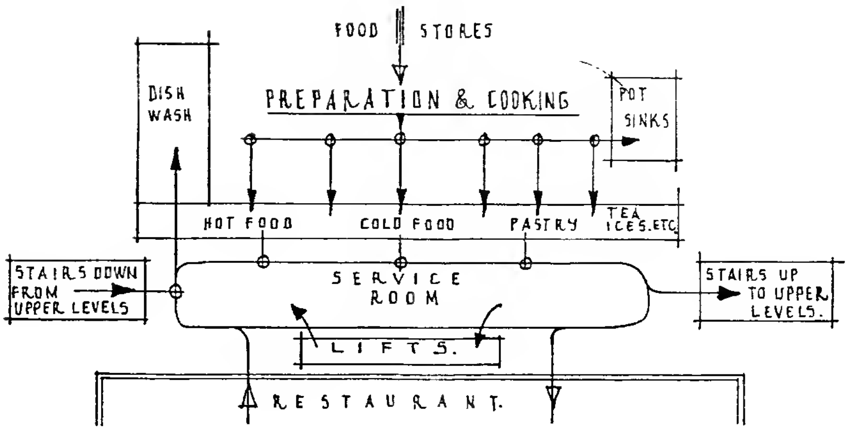



Fig. 29 Kitchens: analysis of service circulations

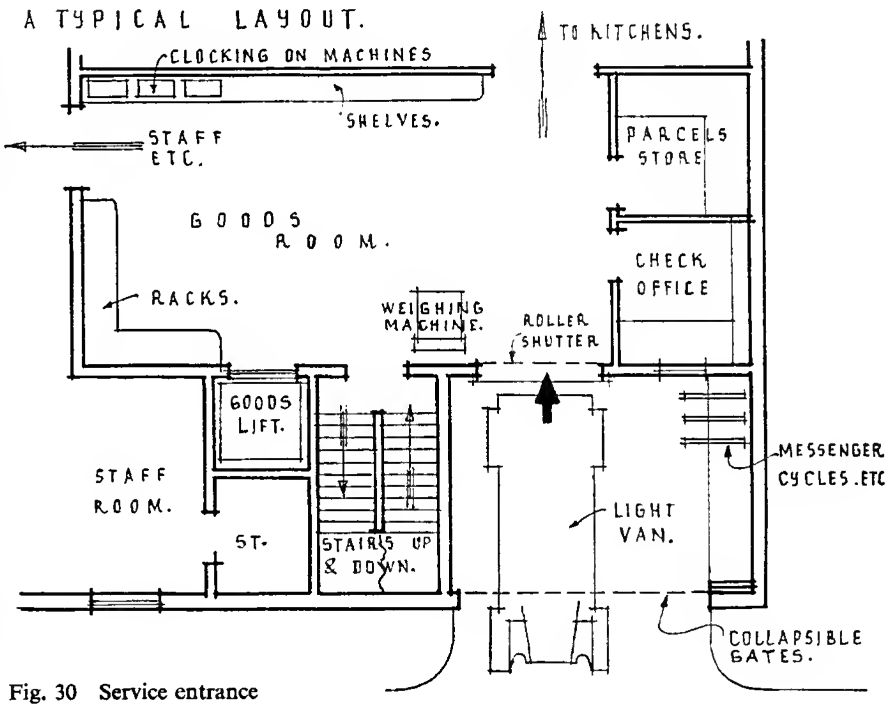



Fig. 30 Service entrance

## LOCKER ROOMS, EMPLOYEES' DINING-ROOMS, VISITING SERVANTS' ROOMS, STAFF BEDROOMS, STAFF VALET ROOMS, GARBAGE, LINEN, SERVICE ROOMS

### Locker Rooms

Locker, changing and toilet rooms are necessary for all staff who do not sleep in the building; in most hotels some or all the chambermaids, and the unmarried members of the office and managerial staff only are resident. Each section of the staff is usually separated, i.e. waiters from kitchen staff or porters, and each section has one or more locker rooms, as necessary for the numbers involved.

Locker rooms and staff toilets are generally placed in basements and are consequently artificially lighted and ventilated, but this does not matter if efficient mechanical equipment is provided.

The staffs of separate departments, such as engineering, laundry (if any) and barber's shop, each require locker accommodation near the respective departments.

### Employees' Dining-rooms

Some hotels provide catering facilities for part or the whole of their staff, sometimes on cafeteria lines in one or more rooms, separating various grades or sections of the staff. It is usual to feed kitchen staff, maids, cashiers, office staff and all who live in, at the expense of the hotel, the wages being suitably adjusted, and if feeding arrangements are made for the external staff, they bear the cost themselves. A separate kitchen is seldom necessary except in very large hotels, but a separate service room is usual, as special china, etc., is used for these rooms.

### Visiting Servants

In better-grade hotels, facilities must be provided to sleep and feed guests' personal servants such as chauffeurs, ladies' maids, valets. These usually take meals either in a room specially set aside for the purpose, and sometimes called the "stewards' room," or in a dining-room used by a suitable grade of the staff. A number of small single bedrooms must be provided, preferably grouped together, with a common room or separate rooms for each sex. In country or resort hotels on open sites, chauffeurs and men servants are often placed over garages, while the maids' rooms are grouped with rooms for the female staff of the hotel. Nurses, secretaries, couriers, and similar more important grades of guests' personal servants usually eat in the dining-room, either alone, in a group, or with their employers, and occupy single rooms on the ordinary bedroom floors.

### Staff Bedrooms

Bedrooms are required for staff who live in. The manager usually has a suite consisting of a bedroom, a sitting-room and bathroom, in a fairly accessible position. The remainder of the managerial staff has small single rooms in unimportant positions on the plan. Maids are generally grouped together in one position, either in dormitories, cubicles, or rooms shared by two or three; the latter is generally preferable. Suitable toilet facilities must be provided on generous lines, together with one—or better, two—sitting-rooms, one as a quiet room and the other where a gramophone or wireless may be played. A small laundry room is also desirable so that maids can do their own washing. Maids' rooms should be on a top floor or in a separate wing. The housekeeper, who controls the female staff, also needs a suite consisting of an office, a bed-sitting-room and a bathroom, but sometimes the office is placed in the working part of the hotel, and her bedroom near the maids' rooms, in order to control the latter more adequately.

### Staff Valet Rooms

Most hotels having a large staff have a uniform room in which spare uniforms are stored and issued and also uniforms can be cleaned and pressed. The accommodation may be conveniently placed near the staff locker rooms.

### Garbage

Garbage collection and disposal present a very difficult problem in hotels. The sources of garbage are numerous and of very varied types; waste paper, general rubbish and dust from bedrooms; waste food, peelings and similar wet rubbish; tins, jars, bottles and boxes from kitchens; ashes from boilers, coal fires and ranges; trade rubbish from workshops and so on. Most of these have a small value which in many hotels justifies proper collection, sorting and removal. Some space in basements must therefore be devoted to storage, sorting and baling. Kitchen and other food waste is generally collected in bins and disposed of as pig food; bins for this purpose have to be stored near the kitchen, especially near the dish-washing section, where they are mostly used, and then retained in some ventilated space near the entrance, where the smell may be controlled and removal to the street is easy.

### Linen

Bulk storage of linen, together with dirty-linen store and mending-rooms, should be placed in the basement. If possible a chute should connect bedroom floors to the basement, where a room for sorting and packing should be placed; this room needs to be fairly large to allow space for storage of baskets, sorting and counting. It is advantageous to have this room in an accessible position in relation to the service entrance for easy removal of baskets, and also near the clean-linen room, where the baskets arrive. The main linen room for clean stock must be large enough to accommodate the shelf space necessary, together with sorting and inspection tables, on which the linen—such as large sheets and towels—may be opened to look for damage which needs repairing. Adjoining the main room should be placed the sewing room in which all repairs are carried out. The size of these rooms depends on the size of the hotel, on the nature of the business (as in some hotels clean sheets, towels, etc., are required for every room each day and at every meal, while in others sheets may only be changed once or twice each week), and on the rapidity of laundry service.

### Service Rooms

Specialized service rooms are required in connection with the operation of a hotel apart from those rooms already mentioned. Rooms as required for the engineering services are likely to be

large in area and require considerable height; these include the boiler room, fuel stores, space for plant such as vacuum cleaning, pumps for raising water to tanks on upper floors, well rooms, refrigerator plant, engineers' office and workshop. The areas necessary are obviously dependent entirely on the size of the hotel, the amount of mechanical equipment and room needed for servicing it; the space allotted should not be cramped, as much of the plant has to be duplicated to guard against breakdown and also allowance must be made for possible additions to the plant in the future. All these rooms may be placed satisfactorily in basements as daylight is not of importance.

### Workshops

One or more workshops are generally provided either in or near larger hotels where repairs to furniture, etc., may be undertaken. Some provision should be made for a small printing press for menus and similar small work, except in the smallest hotels; in large hotels the printing shop is often much larger and prints practically everything necessary for the hotel's use. The workshops have to provide for the following trades :—engineers, electricians, plumbers, glaziers, joiners and cabinet makers, polishers, painters, upholsterers —including curtain makers and mattress repairers. These shops, when necessary, may be placed either in basements, on top floors (for the lighter trades only), or in a separate building which must be in close proximity, as it should be remembered that most repairs have to be executed rapidly and at a moment's notice, and in many hotels time is more important than cost. In many large hotels the " works department " becomes large and therefore needs considerable floor space. Some hotels have as many as fifty employees under a works manager, who requires an office where he may interview travellers, salesmen, etc., and have a clerk or book-keeper. Easy access for materials is important, especially as some of the deliveries may be large or bulky. Noise and smells from paint, etc., must be controlled and kept away from all public and guests' sections of the hotel.

### Telephones

A small set of rooms is required for the telephone equipment consisting of a switch room with one or more switchboards, as necessary, a locker room, rest room and toilet facilities for the operators, except in small hotels when the switchboard may be placed either in the hotel office or in the porter's office.

### Laundry

A few large hotels operate their own laundries and it is surprising to find that this is not a more general practice. Owing to high site values and height limitations in England, it is not often feasible to house the laundry in the

TABLE SHOWING THE NUMBER OF SANITARY FITMENTS REQUIRED IN HOTELS*

| Fitments | For residential public and staff | For public rooms | | For non-residential staff | |
|---|---|---|---|---|---|
| | | For males† | For females† | For male staff | For female staff |
| W.C.s | 1 per 9 persons omitting occupants of rooms with W.C.s *en suite* | 1 per 100 up to 400. For over 400, add at the rate of 1 per 250 or part thereof | 2 per 100 up to 200. For over 200, add at the rate of 1 per 100 or part thereof | 1 for 1–15 persons<br>2 for 16–35 persons<br>3 for 36–65 persons<br>4 for 66–100 persons | 1 for 1–12 persons<br>2 for 13–25 persons<br>3 for 26–40 persons<br>4 for 41–57 persons<br>5 for 58–77 persons<br>6 for 78–100 persons |
| Urinals | — | 1 per 50 persons | — | Nil up to 6 persons<br>1 for 7–20 persons<br>2 for 21–45 persons<br>3 for 46–70 persons<br>4 for 71–100 persons | — |
| Lavatory basins | 1 per bedroom and at least 1 per bathroom in addition to the requirements of clause 5(*a*) | In all buildings it is desirable that there should be a lavatory basin (or basins) in the vicinity of each W.C. or range of W.C.s | | 1 for 1–15 persons<br>2 for 16–35 persons<br>3 for 36–65 persons<br>4 for 66–100 persons | 1 for 1–12 persons<br>2 for 13–25 persons<br>3 for 26–40 persons<br>4 for 41–57 persons<br>5 for 58–77 persons<br>6 for 78–100 persons |
| Bathrooms | 1 per 9 persons omitting occupants of rooms with baths *en suite* | — | — | — | — |
| Slop sinks | 1 per 30 bedrooms; minimum 1 per floor | — | — | — | — |

* (From B.S. Code of Practice, C.P.3—Chapter VII (1950). Engineering and Utility Services.) *See also* Part 1: Sanitation.

† It may be assumed that there will be equal numbers of males and females.

building, as is often done in American hotels. Many American hotels, with as few as 60 bedrooms, operate a private laundry (and show considerable cost savings) for " flat work " such as sheets, towels, table linen. The remainder of the work, especially the personal clothing of guests, requires a great increase in equipment and labour and can, therefore, only be justified in large schemes, unless outside trade can also be obtained. The detail-planning requirements are outside the scope of this section.

### Concession Spaces

Many hotels derive additional income by the provision of stalls, hairdressing rooms and special treatment baths (Turkish, light, etc.) within the building, apart altogether from shops which may form part of street frontages. These special " internal " shops may be operated by the hotel itself, or may be leased as concessions. The most general provision is a stall, or stalls, for the sale of papers and stationery, tobacco, confectionery and flowers; such stalls may well be approached from the main entrance or lounge space and in many examples are merely counter fittings in the hall.

In addition to stalls, showcases for clothes, jewellery, perfumes and similar luxury articles are placed in main corridors, sometimes in the charge of an attendant who sells on behalf of lessees, or alternatively merely as unattended advertising show spaces. Another and general provision in larger hotels is a men's hairdressing department and, in the better types of hotel, a women's hairdressing department; these may be placed in any part of the hotel in which the guests normally circulate, but should not be on bedroom floors except possibly the ladies' department (if it is on the lowest bedroom floor), with easy access from the public rooms.

Some hotels also provide for special facilities such as swimming baths, Turkish and other treatment baths, but the problems of planning such units is considered to be a special subject outside the scope of this section.

### Garages

The garage problem, in conjunction with hotels, presents many difficulties. The problem may be overcome easily in country or resort hotels on open sites, but those on urban sites, especially in central urban areas, cannot, as a general rule, acquire a site of sufficient area on which to plan garages in addition to the hotel accommodation. When, however, such a site is available, a multi-storey garage can be built and the hotel provides for a night load at times when local car-parking is not available; this should therefore help to make a profitable undertaking. Where the area covered by the hotel is sufficiently large, a portion of the basement may well be allocated to garage accommodation. Such a garage would be approached by suitable ramps, preferably from back or side streets. In such a plan, care must be taken to ascertain and comply with the usual fire regulations of the locality, especially with regard to the relation of the hotel fire escapes to those of the garage, fireproofing of the garage ceilings (including the provision of a sprinkler system) and the relegation of petrol pumps to a position outside the main wall faces of the hotel building. For country hotels, ranges of lock-up garages around a yard with a repair shop, pumps, etc., is the best arrangement, but care should be taken to try and select a position where the noise and disturbance do not detract from the comfort of the guests' bedrooms. (*See also* the section on " Garages and Parking Spaces.")

### General Finishes, etc.

Throughout all hotel planning and equipment the strictest care should be taken to provide only those materials, fittings, and equipment which make for minimum of cleaning, upkeep and replacement.

This particularly applies to floor finishes, careful choice of woods, linoleums, carpets, etc.; in furnishing, to the strength of furniture, the quality of hangings and upholstery, etc.; in fittings, to the strength and quality of locks, etc., and to all electrical, plumbing and heating equipment.

The work of upkeep and replacements involves inconvenience, disturbance and noise and, although the cost may be small, the ultimate financial loss may be much greater than the first cost of good materials and first-class workmanship.

# Public Houses

## INTRODUCTION, SITES

### Introduction

The public house has changed its character considerably in recent years, in certain districts more than in others: it now has to be considered as something in the nature of a club for refreshment and entertainment for the use of "everyman."

There are two main types of licence; for the beer house, in which, as the name denotes, beer alone may be served, and licences for the sale of all types of alcoholic drinks. The majority of public houses is owned by brewery companies, although there is a certain number of "free houses." The general tendency, especially in regard to new licences, is towards brewery-owned houses.

All licences are controlled by local licensing justices. Unfortunately, the requirements and views of the benches vary considerably, in different districts, and it is necessary to ascertain their outlook when planning for a particular locality. All schemes, both new and alterations, have to be submitted to the licensing justices before any work may be commenced.

Much has been said and written about the evils and virtues of "standing at the bar drinking," but the new tendency to provide more space and seating has considerable bearing on public-house planning. Bars of the lounge type now require to be planned, furnished and decorated more as family resorts or clubrooms and so as to avoid the effect of mere drinking space.

### Types of Houses

The type of house has considerable bearing on planning and the types of rooms to be provided; the main subdivisions are small houses in towns, large houses in towns, houses on important sites in suburban or country districts, and houses on the open road or in villages.

Small houses in towns usually cater for the needs of the inhabitants of a particular locality, and are often placed in less important streets mainly in semi-residential areas; these may be beer houses rather than fully licensed houses. The main room in this type of house is the public bar, but a private bar, even if quite small, should be provided. A clubroom is very desirable, which can be used for trade union, Oddfellows and similar club meetings. Little is required as regards food catering in this type of house.

Larger houses in towns as a rule have full licences, and cater for all classes of customer. Their sites are often in the more important streets of the town or locality. Several bars of different types, such as public, saloon and lounge, are essential. Provision may be needed in this type of house for lunches or for dances, lodges and dinners.

Houses on important sites in towns or country districts usually cater mainly for a passing trade. The saloon and lounge bars are of greater importance. Good dining facilities are likely to be needed, and facilities for quick snacks at certain of the bars. Country houses of this type need, and, where the site permits, should always be provided with adequate car-parking space, and, whenever possible, gardens for customers to sit in.

Country houses are of two main types, large ones as summarized above and smaller ones either in isolated places or in small villages, catering mainly for a passing trade and a local custom from a fairly wide area. The smaller village house is often only a beer house, but its function as a club or meeting-place for local inhabitants is an important feature in country life.

Living-accommodation should be provided for the licensee in all public houses and it is customary for some, if not most of the staff to "live-in."

Many houses have an off-licence department for the sale of liquor to be consumed off the premises. A children's room is desirable, especially in urban districts, since children under 16 years of age are not allowed to enter the bar spaces. Separate bars are sometimes provided for women; this seems to be a growing tendency in new better-class houses. Lavatory accommodation for both sexes must be provided and be accessible from all bars.

### Sites

The selection of sites for public houses seldom falls to the lot of the architect, although his advice as to the accommodation which might be provided on a given site may be sought very early in a project. The relationship to population and passing traffic is an important factor in site selection; aspect and similar factors matter comparatively little.

Sites for houses on main roads should be large enough to provide for ample car parks, especially if there is likely to be a large dining-room trade. Cars should not be parked on the public highway and in most places such parking may not be allowed by the Local Authority. It is also desirable, although frequently impossible, to provide for deliveries to be made from a yard both to cellars and kitchens; on many sites, however, it is not possible to arrange deliveries to beer cellars except through an opening in the pavement or forecourt.

Corner sites appear to be preferred to all others, due to prominence of position. Signs should be considered very carefully in relation to site planning—more particularly when buildings are set back from the road. When planning for the rebuilding of a public house, it is often advantageous to set back to form a forecourt as a car park; this often permits the existing building to be used in its entirety until the new building is complete. Rebuilding existing houses is often complicated by the necessity of keeping a part of the licensed space in constant use in order to maintain the licence by continuity of tenure.

Fig. 1 illustrates two typical town sites of public houses. Diagram A shows a very restricted site between party walls; two light wells have been introduced, while all the entrances are along the frontage, and are separated as much as the site will permit. Three bar entrances are provided, in addition to one for an off-sales counter. The entrances, except to the off-sales, are set back to avoid placing doors side by side on the main elevation, and also to accommodate a cellar flap without obstruction to the footpath. Diagram B shows a corner site at the junction of a main and a secondary road, again with two party walls as boundaries. The service entrance is placed at the end of the frontage to the secondary road, and the entrances to three bars and off-sales are distributed along the two frontages. The cellar flap is placed in the secondary street in preference to the main street, to avoid traffic congestion as far as possible. The public bar is on the most important frontage, but the saloon-bar entrance in the minor street is placed as near the corner as possible.

Fig. 2 illustrates a public house on a less congested site. The building is set well back from the main road to provide a car park; car-parking should not obstruct the easy movement of any vehicle. This scheme provides for a restaurant which is placed in a wing apart from the bars—a planning point that should be particularly noticed, as it permits the service of teas and similar meals in non-licensed hours without the complication of closing an ordinary bar counter by shutters or other similar means; it also permits use by children.

The scheme allows for circulation of service vehicles round the buildings, through a service yard space and past the cellar flap, which is placed at the back of the building, thus freeing the parking space and footways for public use at all times.

When planning entrances and exits to yards, the maximum turning circles and sizes of delivery lorries and drays should be allowed for. The yard space might well be planned to give a garden view from the restaurant windows by placing the yard gates nearer the service entrance. The lounge entrance is planned near the restaurant, as these two rooms are used, in part, by the same customers. Saloon and public bars both have entrances on the main frontage. The sign is placed on the front boundary of the site in order to be visible to moving traffic in the street.

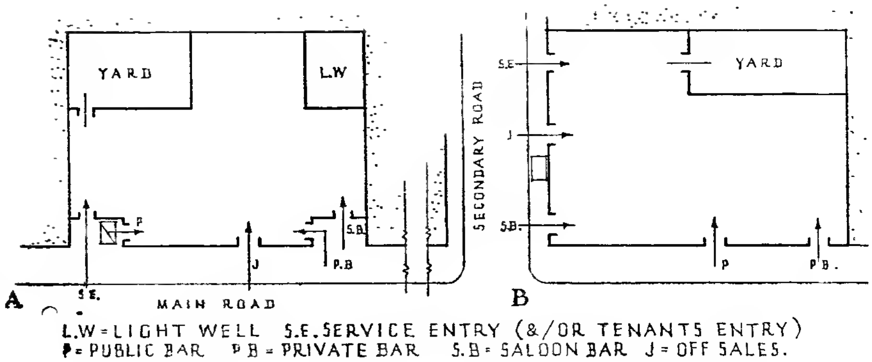
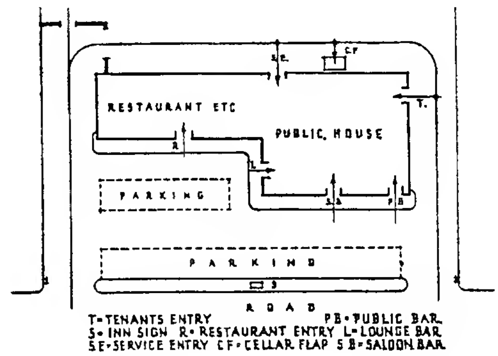



Fig. 1 Town-site considerations




Right: Fig. 2 Country- and suburban-site considerations

## General Layout

The ground floor is the most important part of a public house plan, as the greater part of the service has to take place at this level and generally all bars are planned at street level with only dining- and clubrooms placed on an upper floor. The most important factor controlling the plan is the necessity for complete supervision of all drinking space by the staff from the service areas behind counters; equally, the service spaces must be planned in close proximity for supervision by the licensee and must therefore be intercommunicating. Customers in the separate bars should not be able to see one another. The whole plan, therefore, revolves round the service, from which access should be arranged to cellars and to the licensee's private sitting-room or living-quarters.

It is most important, before commencing a general layout plan, to know

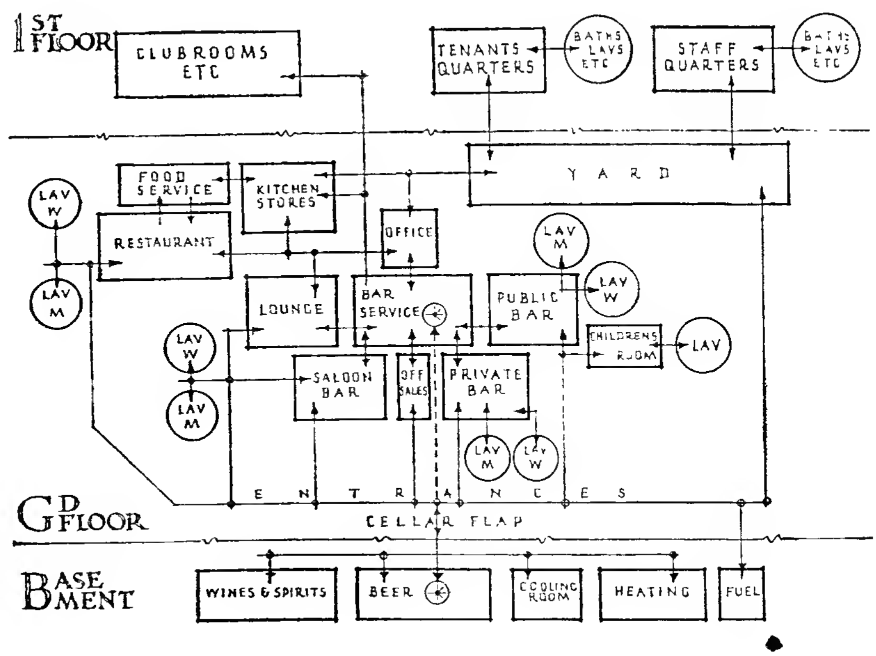



Fig. 3 Typical plan analysis

how the beer is to be stored and served. In large houses, especially in towns, basement beer cellars are usual with pipe connections from the casks in the cellars to beer engines on the counters. Some houses in country districts have ground-floor storage, and in small houses the casks are kept in a servery or in the bars. Each bar should have a separate entrance from the street. Whenever possible there should also be an entrance to the licensee's private rooms which may also be used as service entrance, if a separate one cannot be provided for this purpose. The private entrance should be cut off from any public space. Lavatories must be available for both sexes from all bars.

In urban areas with restricted sites, dining-rooms are often placed on upper floors and should have the kitchens planned adjoining with lift connection to bars for food service. On less restricted sites the dining-room is better placed at ground-floor level. Thc number and type of bars are entirely dependent on locality and class of customers.

The cellar, when in a basement, should be planned as directly below the bar counters as possible to reduce lengths of piping; external access at street level for deliveries is essential for all cellars. Cellars should be connected to bars by means of a staircase and hoists or lifts. This staircase should not be available to the public and should be approached from within the service area. The hoist should also deliver in the service spaces either in the back-bar fitting, under the counter, or in a lobby connecting the service spaces of several bars.

It is essential that all bars should have good daylight, preferably from the street or streets and not from internal areas or wells.

Living-quarters for the licensee vary according to the type of house; generally, two living-rooms are needed for larger houses, and three or four bedrooms and a kitchen. Staff rooms also vary considerably; medium-sized houses require two or three bedrooms and a bathroom, and larger houses may need many more bedrooms or even dormitories and a common room. A staff rest room, cloakrooms and lavatories are essential for all but the smallest houses.

If kitchens are placed on upper floors, as is frequent in larger houses on confined sites, there should be a direct tradesmen's staircase to the kitchen department. The planning for food service may have to provide for meals in dining-rooms, light meals in public bars, for full meals (generally lunch) in saloon bars or at snack-bar counters in saloon or lounge bars.

Fig. 3 illustrates essential relationships of various parts of a public house and stresses points referred to above. The centre from which the whole is controlled is the licensee's office, which in turn controls the bar counters. Attached to or adjoining bars are lavatories for each sex.

Entrances to each bar must be direct from the outside, but one entrance may serve two bars of similar character, such as lounge and saloon bar.

## CELLARS, SPIRIT STORES, WINE STORES

### Cellars

Beer may be stored in a basement cellar, in a store-room adjoining the bars, or in the bars. Wherever casks are stored, easy access for delivery is essential. Below is a table of the sizes and capacities of casks which is useful as a guide—although casks vary according to contents.

Glazed earthenware and glass-lined tanks or containers of three-and-a-half and six-barrel capacities are sometimes installed in houses where there is a large consumption of draught beer. Beer for filling of these "tanks" is delivered in bulk in container lorries. Connection to the counter beer engines is with flexible tubes.

Beer stored in casks or tanks in cellars should be as near the counter beer engines as possible. In most cases it should be directly below the counters, in order to reduce rising pipe lengths to a minimum.

Cellars do not need daylight, nor is complete dryness necessary. Damp cellars appear to be cooler than very dry ones; a constant temperature of about 57° F. is desirable. It is often necessary to install cooling plants to maintain temperatures about this level. Direct ventilation is usually avoided in order to control further temperature. Indirect ventilation should be controllable, and planned to draw air only from cool places and not from warm rooms or warm external positions. The efficiency of the cellar plan and storage conditions are most important factors in the trade of any house. Not only must storage be well planned and maintained at correct temperatures, but deliveries from the brewery must be made in as easy a manner as possible.

Pavement flaps, with or without barrel skids, usually give access to the cellar, although in some schemes vertical hoists are installed; when there is no hoist, skids and steps should be arranged, the former for sliding down casks and the latter for access. Adjoining the skids it is advantageous to have a ramp on which cases containing bottles may slide, as much time may be gained by handling these quickly. When installing access traps for casks, the clear opening should be at least 3ft. 6in. in either direction. When skids for barrels are installed, it is desirable to fix a wooden (often oak) or similar pad to break the fall of the casks at the cellar floor level. The inclined planes for cases are sometimes made up of a series of rollers, and it is an advantage if these deliver on to a low platform rather than on to the floor. Cellar flaps, since they give direct access to the cellar, are better placed in shaded positions.

Fig. 4 illustrates, with essential dimensions, a typical cellar access arrangement, including the barrel skids and steps.

The best finish for cellar walls is glazed bricks or at least bricks having a very smooth surface both to give an appearance of cleanliness and also to make for easy cleaning. Exposed angles should have hard bull-nosed bricks, especially near any part of the cellar where casks and cases are handled. Floors should be of impervious materials and laid to falls leading to gullies so that the whole may be washed down easily and quickly.

The cellar may comprise one large open space, but in many places a section for wines and spirits, divided from the remainder by walls or wire mesh, is required. In some cellars the actual beer storage space is also cut off, so that a cooling plant only has to operate for a limited part of the total area; such cooled spaces often have insulated walls. Various types of special localized cooling apparatus for draught beers, which do not mechanically cool the entire cellar areas, are worthy of consideration.

Fig. 5 illustrates a typical cellar plan. The heating chamber is separated from the beer cellar by specially thick walls and, in addition, the fuel store is planned to form a division between the heating chamber and the wines and spirits store. The latter is separated from the main area of the cellar in which the beer, both in casks and crated bottles, and mineral waters are stored. The stillions, or cask racks, are placed as directly as possible below the bar counters.

Stillions are sometimes fixed, but some prefer them to be movable for cleaning down the cellar. They are frequently made of heavy timbers in lengths for several barrels, and sometimes each cask is placed on a separate barrel tilt. When basement cellars are not used, and consequently no beer engines are required, barrel tilts of various designs are available.

### Spirit Stores

The storage of spirits calls for little special equipment other than bottle or case racks for storage. Spirits are usually stored in the cases in which they are delivered.

### Wine Stores

Wine, however, needs much greater care, especially in those houses which have a considerable better-class restaurant trade. Proper cellars often have to be constructed and care must be taken to select a position where temperatures remain constant, or which may be maintained at the varying temperatures needed for each type of wine; these temperatures vary from 50° F. to about 58° F. The bottles may either be stored in brick or stone bins, on metal shelves, or in one of the various types of wood and wire racks in which each bottle is separated from those adjoining. Stone bins are usually constructed with spans between supports of 3ft. to 5ft., 1ft. 6in. to 2ft. in height, and 15in. to 18in. from back to front, although sometimes the latter dimensions are made greater to provide for two rows of bottles end to end. Wire-type bins are constructed in square units approximately 4in. centre to centre in both directions, and may be built up into units of any required size; such bins will hold all normal bottles,

TABLE SHOWING THE SIZES AND CAPACITIES OF BEER CASKS

| Name of cask | Capacity in gallons | Extreme diameter (ft.) | Extreme length along stave (ft.) |
|---|---|---|---|
| Barrel .. .. .. | 36 | 2·10 | 2·42 |
| Kilderkin .. .. .. | 18 | 1·70 | 1·81 |
| Firkin .. .. .. .. | 9 | 1·41 | 1·37 |
| Small cask .. .. .. | 6 | 1·15 | 1·30 |
| Pin .. .. .. .. | 4½ | 1·10 | 1·25 |

but larger sizes, for magnums and similar specially large bottles, are also made. Bins may be single- or double-sided; single-sided racks are usually 9in. deep and double-sided 18in. (unless racks of the "French wave" type are used, when the depths are usually 12in. and 19in.). The space between faces of bins should be at least 3ft. wide for circulation. Metal bins are usually 1ft. 5in. deep, formed of steel bars on cross bars with lattice uprights.

Great care is essential in cellar planning to avoid trouble from heating chambers, and to avoid hot pipes to radiators in bars passing through cellar spaces which must be kept cool.

Ground-floor or bar-level "cellars" from which beer is drawn direct from the cask usually have the barrels placed on wooden racks, either near floor level or about 2ft. 6in. high, or on patent cask tilts; racks or tilts at a high level assist service, although it is more difficult to place casks in position. "Cellars" in this position must be carefully insulated, and cellars required for a row of casks against a wall should not be less than 6ft. wide.

From basement cellars two methods of lifting are used: first, beer engines which are pumps; and, secondly, pressure systems which depend on using $CO_2$ or air. The piping is made of various materials, such as tin-lined lead, porcelain, rubber, glass, an alloy of nickel and copper, stainless steel or plastic; of these, glass with rubber connections is now the most general.

The pumps for beer engines may be placed on the bar counter or over the back-bar fitting or cabinet. Pumps are usually placed in groups of two or three at intervals along the bars.

### Hoists

Vertical mechanical connection between cellars and bars saves much work in transporting casks, cases of bottles, etc., from storage to bar counters and back-bar fittings. The size varies considerably according to the type of house, but 3ft. by 2ft. 3in. at least is desirable; in many, they are only large enough to carry about two crates of bottles, while in others they are very much larger for moving casks or numbers of crates at one time. It is essential that the hoists deliver inside the counter space or into a lobby between bars. Hoists may be hand- or power-operated.

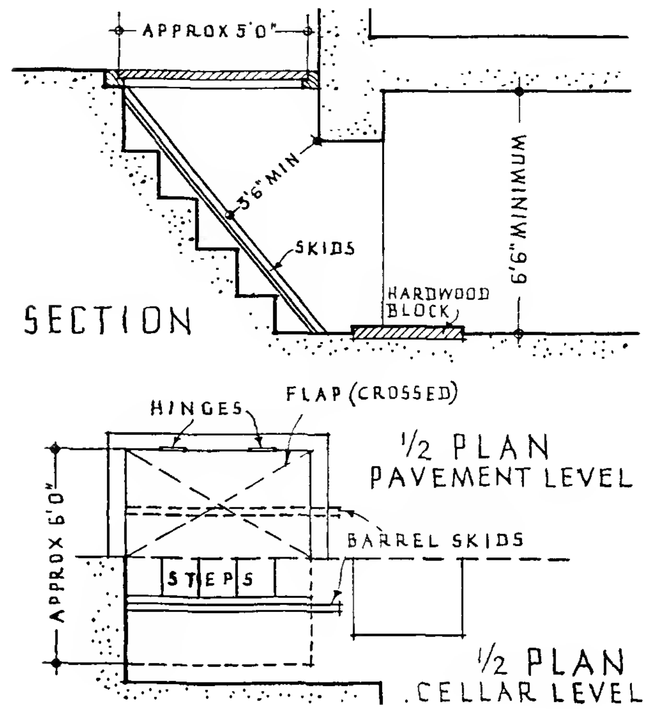



Fig. 4 Cellar flaps

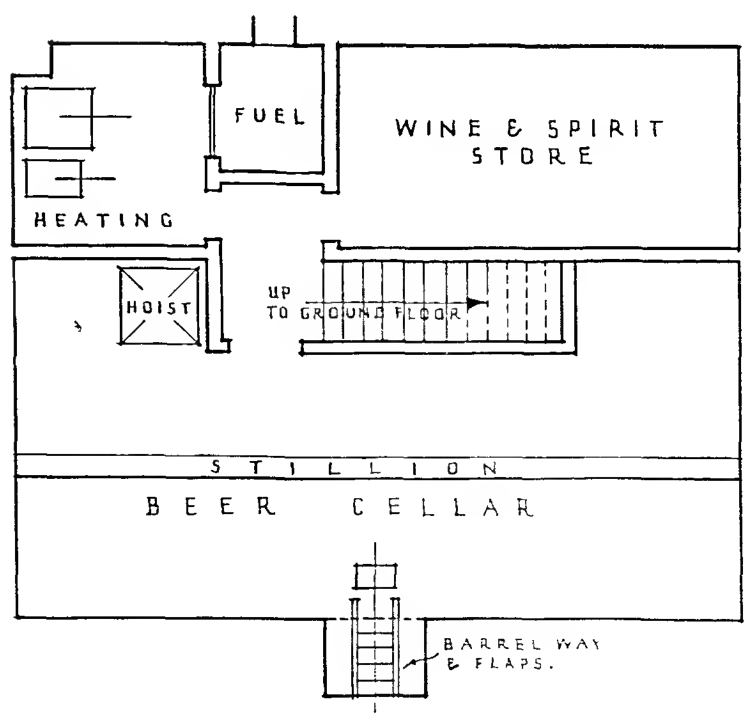


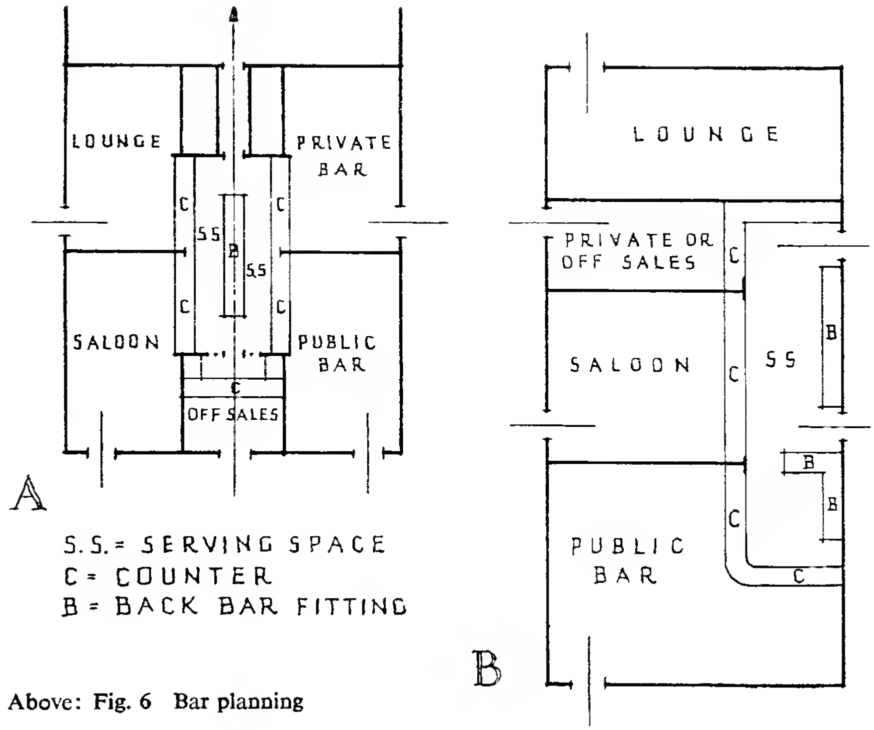

Fig. 5 Typical small cellar

## OFF-LICENCE, ENTRANCES TO BARS

### Off-licence

This department is also called " Jug and Bottle " and " Off-Sales." There are two general schemes of accommodation; first, as a separate building, and secondly as a room or bar between or adjoining other bars. The separate building is useful only when there is likely to be a large outside trade, as it necessitates someone in charge during all permitted hours of sale who cannot be available to help in other bars. Separate buildings permit external display windows. Whenever possible some showcases for display should be provided externally, and internal display cases are essential. A short counter should be provided and, apart from this, the main equipment needed is adequate shelving for storage of bottles, or easy access to such storage space.

When off-sales are limited in amount a small bar adjoining others in the house, but screened from them, permits the off-sales counter to be part of the main bar counter of the house, and service is provided by the bartenders.




Above: Fig. 6 Bar planning

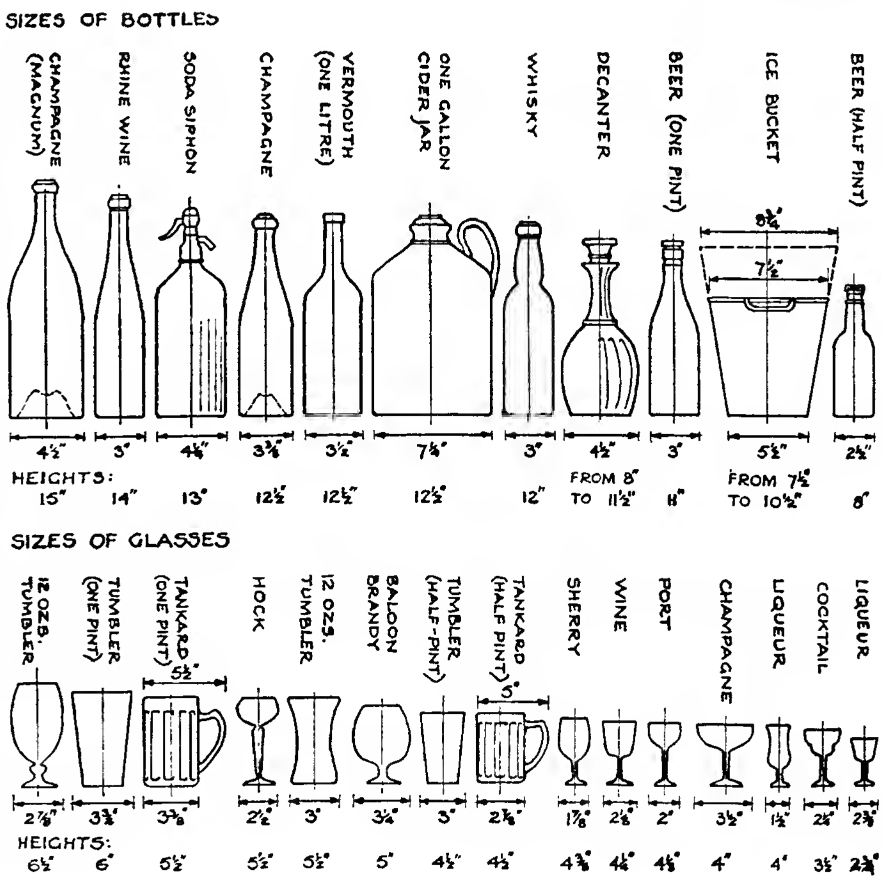
### Entrances to Bars

Some authorities insist on double exit doors, particularly in buildings licensed for music and dancing, but otherwise single doors are generally preferred. Single doors are preferable if doors open inwards only, but some authorities again require double-swing doors, or double doors opening outwards. Double exit doors, used only occasionally, must be provided with panic bolts.

It is usual to hang doors with floor springs and to avoid latches, unless the situation dictates otherwise. It is desirable to form vestibules at entrances, especially in windy or exposed positions. Wide vestibules with collapsible metal gates are often used to serve two bars, mainly, it would seem, to avoid placing two doors close together on an elevation, but when this scheme is adopted the adjoining bars should be planned to serve a similar class of customers; thus, a public bar and a saloon lounge should not be grouped together.

Revolving doors, although useful for restaurants and hotels, are seldom used for entrances to bars; they are generally unpopular, and need considerable space, especially if the doors

Below: Fig. 7 Sizes of bottles, etc.



have to be inset to permit external doors or gates to close the opening completely in non-licensed hours. It is desirable that doors be about 3ft. wide in the clear, and have the upper parts glazed, or have at least inspection panels, particularly when double swing doors are used. Proper mat-well sinkings should be provided at all entrances, and made as large as possible.

**Bar Planning**

The shape of a bar does not seem to be of great importance provided that the whole room may be constantly supervised by the bartender, but shapes with suitable spaces for games such as darts, without interfering with non-players, are advantageous. The areas required for each room or even comparative sizes of rooms cannot be laid down, as variations are likely according to the type of trade common to each house, apart from limitations of site and any restrictions by licensing authorities. Counter lengths are also governed by the type of trade; public and saloon bars need long counters, but lounge bars of all types need shorter ones: where waiter service is provided, the counter may become merely a small hatch, or a short length of screened counter.

Fig. 6 illustrates two typical bar and service plans, arranged on two distinct types of layout. In Type A the main service area is centralized with bars surrounding it, whereas in Type B the service space is arranged in one continuous length, with the bars placed mainly on one side only. The service space in Type A is more compact, but customers can to some extent see from bar to bar across the service spaces, although double-sided back-bar fittings make fairly adequate screens.

The divisions between bars are often screens of panelling with access doors on the service side, so that staff may pass from bar to bar without entering the counter space. Many of these screens are solid up to a height of about 7ft., with the upper part glazed. Wicket gates and flaps should be provided in counter fronts for the staff to reach public areas for collection of glasses, etc.

Bars should have ample daylight. It is usual to fill windows overlooking public thoroughfares with obscure glass to at least eye level. Window-sill level is preferably kept above the level of the backs of fixed seats or chairs. When bars overlook large private forecourts or gardens, French windows should be provided, especially if there are terraces and sufficient space is available for tables and chairs.

Fixed seats, usually arranged round the walls, are frequently incorporated in bars of various types. In lounge-bar types, where there are chairs and tables, the layout should be based on the use of small square or circular tables about 2ft. overall with both armchairs and small chairs.

Most bars need a fireplace even when central heating is provided. Coal fires are a popular and desirable type of auxiliary heating. The placing of fireplaces often adds to planning complications in bars, especially when there are large dining- and clubrooms on the floor above the general bars, since the fire should be placed away from the counters, out of the way of any draught from entrance doorways, and at the same time be available for customers and out of the way of such games as darts. Central heating is provided in all better-class houses of recent construction.

Folding screens are often installed between bars or between spaces which are used for different purposes at various times of day, as, for example, to separate part of a lounge to form a dining-room where there is a special lunch trade, but little demand for meals in the evening when the space is more advantageously used as a lounge. Folding partitions are also useful to reduce the size of rooms at times when bars are less crowded, as half-empty bars create a bad impression.

**Back-bar Fittings**

These fittings, being in constant view of the customer, should be treated in an orderly and pleasant manner. The fittings are often elaborate in design, although primarily must supply large shelf spaces. The lower portion should be at least 1ft. 6in. wide and have a main table or counter top at about the height of the serving counter; it is usually of hardwood, for cleanliness and resistance to wear and tear. The lowest shelf should always be lifted slightly above the floor level of the counter serving space. Shelves should be strongly constructed to carry loads of bottles, etc. The upper part of the back-bar fitting is more in the nature of display, and lighting (often hidden) is usually designed to enhance that purpose. The higher shelves may be narrower and are frequently of glass and adjustable in height. These fittings are generally fixed and often planned to form screens or divisions between bars or between bars and service spaces or the licensee's office. Sometimes doors are required in lower parts of the fitting. Service lifts, hoists and refrigerators usually have to be planned in conjunction with these fittings, often within the area of the fitting itself, and the entire layout should be considered carefully in relation to the appearance from the public side of the bar counter.

### Counters

Counters and bar fittings must be considered jointly, as covering the complete bar plan and equipment. Counters must be so planned that the whole room is visible to the barman for supervision. It is usual to raise the floor within the counter space 2in. or 3in. above the general floor level to help towards control.

The space between the counter and back fitting should be at least 3ft. wide and is better increased to 4ft., more especially in large bars where several persons may be serving. Bar counters are usually made about 3ft. 6in. high above the general room floor-level. Bars are constructed in various ways; some have little overhang of top from front; others have a large overhang; equally, in some the undercounter is on the same face as the back of the top counter, but in many others the under-counter projects about 8in. Counter tops should be from 1ft. 6in. to 1ft. 10in. wide, of various materials, such as hardwood, linoleum, plastic materials or even sheet metal; the factors in selection of materials for counters are resistance to damp, stains and burning and non-liability to damage glasses. The overhanging top has various advantages, especially if stools are to be used in conjunction with counters; the overhang also assists preservation of the bar front.

Bar fronts in first-class bars are frequently of veneered woodwork to match panelling; although this may be considered more decorative, such fronts do not stand damage well, particularly from stubbed-out cigarette ends. Fronts are better of solid-framed hardwood, or faced with linoleum or metal, with a high cove at the base of terrazzo, tile or metal, which receives the wear from floor washing, kicking and cigarette ends. The cove can be continued as a floor band round the counter, preferably about 1ft. 6in. wide, to act as an ashtray, etc. Fronts are frequently sloped inwards to increase toe space, and this is specially desirable if tops do not overhang counter fronts. Counter fronts used also for the service of food often have a double top forming a shelf for gloves, books, handbags, etc. Sometimes a solid projection is made to form a foot-rest in conjunction with either fixed or movable stools. Fixed seats are often installed for bars serving food. Foot-rails appear to be a

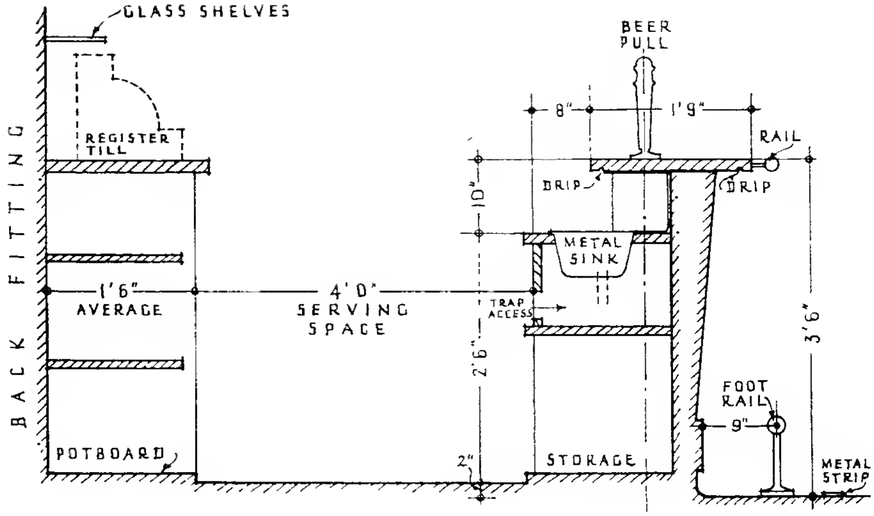



Fig. 8 The bar counter

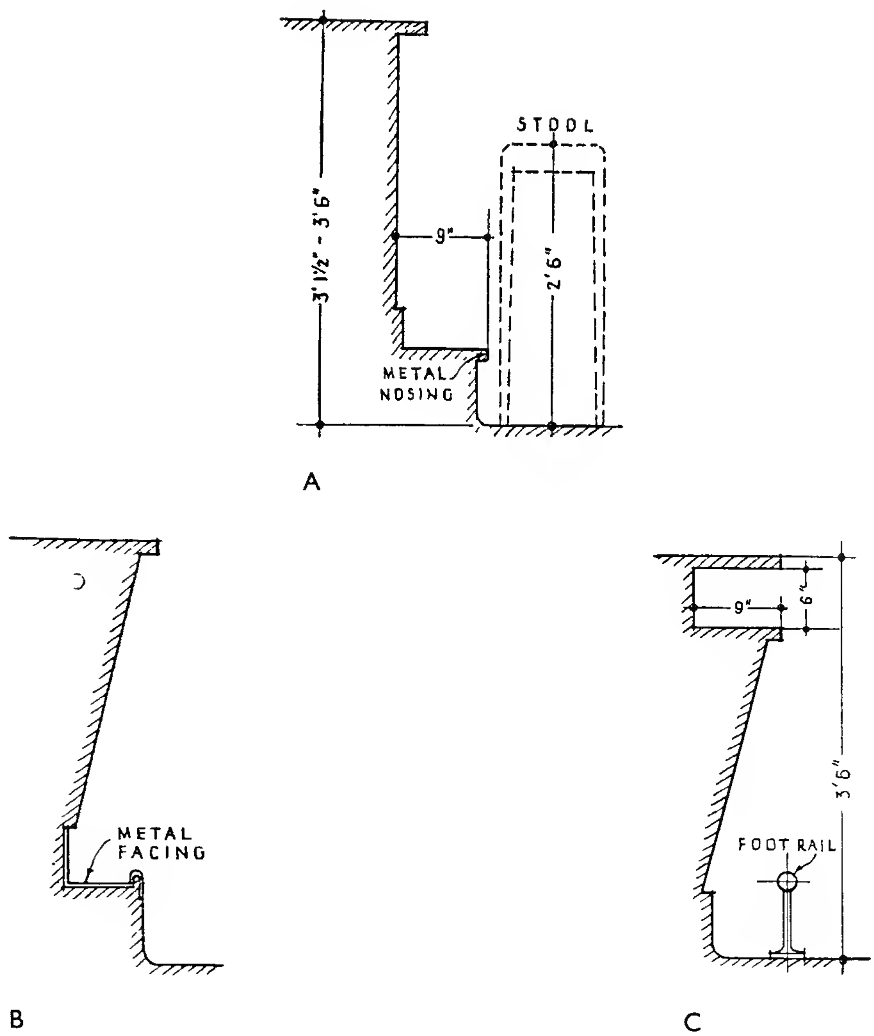



Fig. 9 Typical bar-counter fronts

controversial subject; many like them at all bars and, if stools are regularly in use, they seem very desirable. Saloon and lounge bars usually have foot-rests which should be of wood or metal supported well clear of floors and counter fronts, for easy cleaning and to avoid damage to bar fronts.

Beer-engine pulls are usually fixed to the counter top, and drip trays planned under the outlets at a general under-counter level. In the under-counter are placed the sinks, which are, as a rule, of metal with metal draining-boards; in many schemes the whole of the upper part of the under-counter is metal-covered; the metalwork is carried up at the back and sides as a guard against splashing for a height of at least 8in. or 9in. The under-counter is often projected into the service space, so as to make the washing of glasses easier and to facilitate placing of drip-trays under beer pulls. The spaces not required for sinks, drip-trays, etc., are used for storage of glasses, bottled beers, minerals, etc. The portions of counter front around the beer pulls generally should be made removable. Hot and cold water should be provided to all sinks; a dreg sink, connected to the trap of the wash-up sink, is often installed.

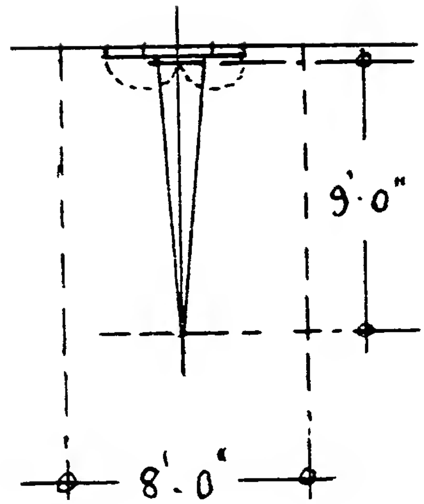
Some houses now install glass-washing machines, which are available in various types, and the space they occupy is a very small part of the under-counter area.

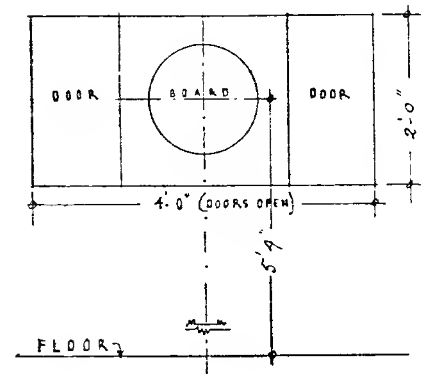
As to the construction and finish of bars, there is much variation in type and quality according to the class of trade and the type of bar. Public bars are usually heavily constructed but inexpensive in finish, whereas saloon and private bars are often more elaborate. A certain amount of display is needed, but this is usually confined to the back-bar fittings; the important factor throughout is quick and easy service.

Fig. 8 illustrates a typical bar counter section, including space generally allowed for service and back-bar fittings—although in some instances these are varied to accommodate hoists, service lifts, refrigerators, etc. It should be noted that all cash is usually kept in the back-bar fittings, or in cash registers placed in a similar position. The figure also shows a rail at the front of the counter top, which has certain advantages in preventing customers' clothes touching bar tops, which may be wet. Such rails may be of metal or wood, or may be formed by cutting slots in the counter top near the front edge.

Fig. 9 illustrates three further types of bar counter-front sections. It should be noted that in some schemes, especially in snack bars, the counter height is sometimes reduced to as little as 3ft. above the floor; some authorities consider this lower height to be more comfortable for use with stools. Other authorities, on the other hand, raise the counter and make use of normal height stools. Snack bar counters are better increased a little in width to accommodate customers' plates and to display food in glass cabinets.

Diagrams A and B show two counter fronts with permanent raised steps instead of foot-rails: these are in many respects more comfortable for meals. Type A has a flat metal-covered step with a skirting on the main bar front, whereas Type B has a definite tray at the step level. Diagram C shows a counter with an undershelf, suitable for snack bars. Types B and C have the front sloped back to allow customers to sit as near as possible to the counter front, with ample foot-space.




Above: Elevation

Left: Plan

Fig. 10 Dart boards (all sizes are minimum)

### Games, etc.

Many games played in public houses, such as table skittles, shove-halfpenny and dominoes only require suitable tables; but games such as darts should be given careful consideration when planning the bar layout. Darts require a board fixed in a definite position and a cabinet with doors to house the board, either fixed to the wall or incorporated in the panelling. The placing of the dart board must permit the necessary 9ft. long "throw," and be such that players cannot cause any danger to other customers; adjacent gangways and doorways should be avoided.

Fig. 10 illustrates a typical dart-board cabinet and more important general dimensions. The centre of the board should not be less than 4ft. from any doorway or gangway but it may be placed as near as 2ft. 6in. to a side wall. Provision should be made for local artificial lighting of the board.

Billiards tables are provided in many houses, although there appears to be less demand in recent years—with the result that the space is more often used for lounges. (*See also* Part 1: Recreation: " Adults' Indoor Recreation.")

In certain parts of the country skittles is a common and popular game. It is played in a skittle alley under cover; in view of the amount of space required the accommodation is more generally found to be provided in rural or suburban areas.

The alley should be well lit, heated and ventilated and some seats (generally fixed) provided for spectators. A service connection to the general bar service, under cover, should be planned.

The internal minimum overall size for a single alley is 45ft. long by 10ft. wide; two alleys, side by side, can be arranged in a width of 18ft. to 19ft. As the game is noisy, the alley should be separated from the quieter parts of the house; it is sometimes housed in a separate building or annex or combined with a garage block and related to a garden layout.

Many houses in suburban or rural districts provide for a variety of outdoor games, such as quoits, bowls and tennis, the requirements of which are given in Part 1: Recreation.

Some brewery companies and licensees like to provide separate games rooms, so that customers likely to remain for long periods may use these rooms without disturbance from other customers. The planning of games rooms calls for no special comment except that no very great length of bar counter is required. Clubrooms also require little special planning. Service is provided either from an adjoining lobby connected by lift, if on an upper floor, to the main service bars, or by a hatch to the latter if on the ground floor.

Wireless and television are becoming usual in many bars. The instruments should be placed so that wires, etc., are concealed and the controls under the supervision of the staff only. In larger houses sound-radio is often provided from a central instrument with speaker relays to the various bars.

Television instruments should be carefully located so that reflections on the screens of external light sources are avoided. Care should also be taken to choose positions that do not lead to local congestion of circulations within bars, etc., caused by undue crowding around the screens.

Music and dancing licences are often required for bars and other rooms in public houses. The requirements of the plan are generally not affected except in regard to sizes and planning of staircases and exits. (*See* section: " Hotels.")

**Lavatories**

Lavatories should be provided off each bar for each sex. In some schemes two bars of a similar type may use the same lavatories, approached from a common lobby. The planning of lavatories often proves to be one of the greatest difficulties of a scheme, more especially when it is insisted that the entrances be planned off each bar with doors in view of the service space. Sometimes authorities permit lavatories to be approached from entrance lobbies to bars, but many insist on approaches from the bars. Adequate ventilated lobbies are essential, although often difficult to plan.

One W.C. for each sex is usually sufficient for all except the largest bars and, in addition, some urinal space for men. The latter should provide for not less than three persons. Some districts still favour external access to lavatories (especially for men) in conjunction with public bars, but internal approach is generally considered preferable. It is usual to tile lavatories and W.C.s to a height of at least 7ft.; all equipment must be selected to withstand hard wear and all surfaces should be capable of easy cleaning.

The ventilation of approach or cut-off lobbies can often be achieved by means of false ceilings over entrances or other lobbies. The detailed planning of public house lavatories is similar to the planning of lavatories in other buildings to which the public have access. (*See* Part 1: Sanitation.)

Fig. 11 illustrates a typical plan of sanitary accommodation attached to a bar; doors leading to the accommodation for each sex are shown adjoining the counter, but should be as far from it as the plan will permit. The lobby to the men's lavatory is ventilated over that to the women's lavatory by means of a duct to the open air. Adequate light and good ventilation are most essential in all schemes. Lavatory basins should be provided in lavatories attached to bars catering for higher classes of trade, especially when there is restaurant accommodation.

**Licensee's Accommodation**

The living-accommodation for both licensee and staff is covered by ordinary domestic planning and does not call for special comment here. In some houses, especially smaller ones in country districts, a living-room is planned in close conjunction with the bars to assist supervision, and to allow the licensee to sit in comfort at times when the various bars are not busy.

When service of food, either snacks or full meals, is likely, adequate space should be allowed in kitchens in addition to any normal needs of the licensee and the staff. When dining-rooms are planned sufficient servery space adjoining the room to be served is essential, and if the dining-room is on a different floor level, suitable lifts must be installed, preferably in duplicate; two small lifts are usually the most satisfactory, and are likely to be more efficient than one larger one. When current is available, lifts should be electrically, rather than manually, operated. (For restaurants and services thereto *see* section: " Hotels.")

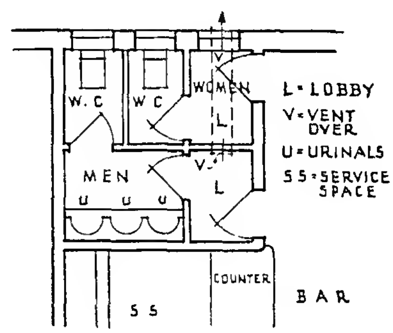



Fig. 11 Typical lavatory in a public house

### Introduction

The Education Act 1944 has led to very great changes in education which in turn react on the planning of school buildings. The Act provides for building regulations (under Section 10) prescribing standards for school premises, confirmed and issued in March, 1945 (H.M.S.O., price 6d.). These regulations are amplified by a Ministry of Education memorandum (H.M.S.O., price 6d.) and the Ministry of Education circular No. 10 (H.M.S.O., price 1d.). These references have since been amended by various Ministry of Education circulars and particularly by the issue of a series of Building Bulletins of which No. 1, " New Primary Schools " (H.M.S.O., 1s.), No. 2, " New Secondary Schools " (2s.), No. 2A, " Supplement (New Secondary Schools) " (2s. 6d.), and No. 7, " Fire and the Design of Schools " (2s. 6d.) are the most important. For some years there have been no definite regulations controlling school buildings, but from time to time guidance was issued by the Board of Education in the form of memoranda and recommendations. Normally building by-laws will not be applicable, as the 1944 Act exempts school buildings approved by the Minister from the application of the Public Health Act, 1936, but it will be necessary for all school buildings to comply with the requirements of the building regulations issued under the 1944 Act.

The Education Act, 1944, provides for changes in future education, and these changes are emphasized by the building regulations and the explanatory memorandum. The compulsory school age is to be raised from 15 years to 16 years in the future, and ultimately it is to be followed by compulsory part-time continued education for all young persons (under 18 years). The sizes of classes are to be reduced progressively from 50 to 40 children in primary schools, and from 40 to 30 children in secondary schools.

An important and overriding factor very seriously affecting the design of schools is the issue, from time to time, of M.o.E. circulars limiting the permitted cost per place. At the same time greater freedom is being permitted in planning, with a view to keeping reasonably within the " cost per place " allowed as this cost has been progressively reduced.

These notes are prepared on the basis of encouraging good school planning and accommodation and may, therefore, depart from official recommendations arising temporarily from excessive economy measures.

### Classification of Schools

The Act and the regulations made under it provide for the requirements of all schools, whether administered by local education authorities or aided in some manner by local authorities. The terms used in the Act to differentiate between the two types of control are " County Schools " for all those administered by the local authorities, and " Voluntary Schools " for those administered by bodies other than local education authorities.

The accommodation in schools is based on one or other of two factors; for smaller schools the basis is the number of classes having a maximum of 40 pupils in primary schools, while for larger primary and secondary schools the basis is the number of forms of maximum size (primary 40, secondary 30) entering the school in any one year. To ascertain the maximum number of children to be accommodated in any school or department of a school based on " form entry," the number of " entry forms " is multiplied by the maximum class size and the result multiplied again by the number of years a child spends in the school; for example, three-form entry in a secondary school is $3 \times 30 \times 5$, giving a total of 450 children.

The accommodation for the classes in nursery schools is based on units of a maximum of 40 children, with relative maximum numbers over and under three years of age.

The accommodation and numbers in special schools vary according to the type and extent of the disabilities of the children for which each school is provided.

The classification of schools and those attending them has undergone several changes; schools, with a few exceptions, are no longer " all-age-schools."

Fig. 1 is an attempt to illustrate the classification of schools under each of the two types of education controlled by local authorities. It should, however, be borne in mind that there are many possible variations due to special

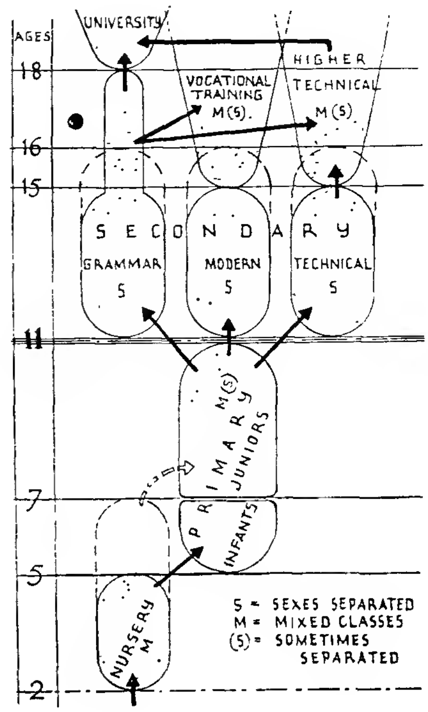



Fig. 1 Classification of county and voluntary schools

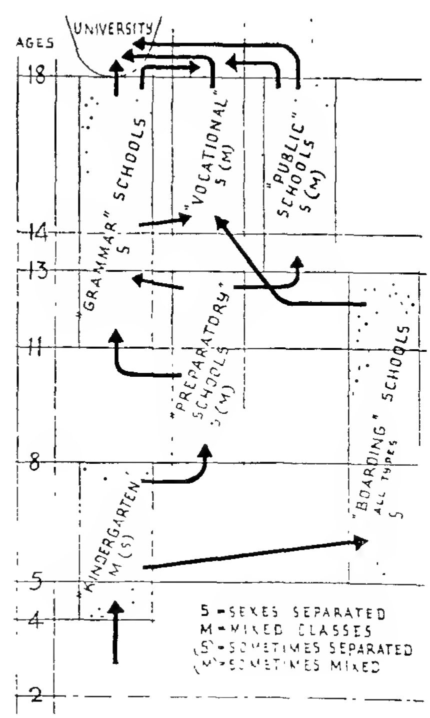



Fig. 2 Classification of independent schools

circumstances, such as in villages where populations are small, or in crowded urban areas. The first divisions in schools controlled by local education authorities are nursery schools, or a nursery department of an infants' school for children of both sexes from the age of two years up to five years, and in some instances to seven years. Compulsory education commences at the age of five years, and from that age until seven years attendance would be in infants' classes or separate infants' schools, which usually accept children of both sexes. Primary schools deal with children from 5 to 11 years, which comprise infants and junior departments. Primary schools are sometimes mixed, but more often for one sex only.

The main division is at the age of 11 years, when the transfer is made to secondary schools, in which the sexes are usually separate. The children remain at secondary schools until the leaving age of 15 (or 16) years, or until passing on to university or to advanced vocational training at 17 or 18 years. Secondary schools are of various types, as indicated in Fig. 1, and are divided into three main types, namely " grammar," " modern " and " technical "; it is suggested that the grammar type may be subdivided into (a) schools having a leaving age of 16, and (b) schools, such as the existing high schools and grammar schools, having a leaving age up to 18, intended particularly for pupils passing on to higher education. For the modern and technical types a leaving age of 16 is envisaged for the majority of pupils and those wishing to continue on to senior technical schools.

Secondary schools often provide for two or even three of the above categories; they are referred to as " bilateral " if there are two of the three types, " multi-lateral " if there are all three types in clearly defined sides, or " comprehensive " if there are all three types without clearly defined separation.

There are also " special schools " which care for children who need special educational treatment due to physical or mental defects, and the gradings referred to above do not necessarily apply.

The schools under private governing bodies tend to have rather different gradings and age groups. Fig. 2 illustrates the broad divisions in education controlled by the " independent authorities " in relation to the age groups of the children. The kindergarten or infants school often keeps the child to the age of eight years, after which it passes to a preparatory school, boarding school or junior section of a grammar school. The grammar schools and similar semi-public schools take children from 10 to 11 years up to 17 or 18 years.

Children going to preparatory schools pass to " public schools " and similar schools at about the age of 13 years. From these schools, as well as from the secondary and technical schools previously mentioned, the universities are fed, as well as the main vocational training schools. Most independent schools accept pupils of one sex only after the age of eight years. There are, however, a few co-educational schools for older children.

Although the building regulations do not apply to independent schools, the Education Act provides for the registration of these schools, and the premises of such schools have to be approved on behalf of the Minister and it may. therefore, be assumed that schools of this type should broadly conform to the same standards as those laid down for county and voluntary schools.

### Aspects

Sites should be open enough to obtain the maximum benefit from sunshine. South-east is the best aspect for classrooms, although in warm and sheltered localities rooms facing in a more easterly direction may be used. South-westerly rooms get less sun in the early part of the day, while later in the day they are apt to be hot, and excessively sunny, which is trying to the eyes of pupils. The remaining aspects are suitable for other purposes, such as cloakrooms, cookery, art and science rooms, in which direct sunshine is of less importance and even undesirable. Fig. 3 compares the sun in rooms facing south-east, south and south-west. Diagram A is a sun-range figure for London. Diagram B shows the south-east aspect room, and it will be seen that direct sunlight enters the room long before lessons start, which is usually at 9 a.m., thus warming and cleansing the room before the admission of the children, who may then start work in a bright, sunny room; also, the sun continues to shine into the room until 4 p.m., when most classes end. It will also be seen from the figure that the afternoon or hottest sun does not shine very directly into the south-east room. Diagrams C and E show the effect of the sun in a south-aspect room; the room has direct sunshine all the working day, but it shines too much on the desks—particularly during the summer months—which is trying to the eyes and necessitates screening. Diagram D shows the south-west-aspect room in which the sun does not fully penetrate until after the morning classes have begun, and is directly on the children during the hottest hours.

Another disadvantage of windows facing south-west is that the heaviest rains often come from that quarter, thus making the opening of windows more difficult. South-west aspects show slight savings of artificial light in the winter months, but this is of small importance as the school day generally ends at 4 p.m.

If schools are planned on open-air or semi-open-air lines, aspect is a more difficult problem, and orientation depends largely on the type of plan adopted for the rooms; the object is to ensure that all teaching rooms have direct sunshine during part of the working day in the manner least uncomfortable to the occupants.

### General Planning

There has been a changed approach to the adoption of rigid areas for rooms for various purposes. Designers are now encouraged to treat suggested areas as minima and to increase them, keeping only within the maximum prescribed costs. The required allocation of space varies considerably according to the size and type of school; thus designers should follow carefully the various suggestions set out in the Building Bulletins of the M.o.E.

One of the governing factors in the planning of schools is the number of storeys on which the accommodation is disposed. There is a tendency to use single-storey buildings for nursery, special and primary schools whenever land areas permit, which is, broadly, in all except very congested urban areas. Secondary schools, however, are often planned as single- and multi-storey buildings, the latter tending to be the more usual. Single-storey buildings tend to become very spread out if the school is large, thus involving long circulations and more difficult supervision. Other factors to be considered in the decision on the number of storeys are the site contours, type of construction, method of daylighting to be used for classrooms, and local preferences.

Plans may vary greatly in shape; spread out, very compact and built round courts or quadrangles. It is important to anticipate that extensions may be needed at some later date, and consequently very compact plans, especially if built round a courtyard and closed on all sides, are difficult to extend. Varying uses of school buildings during and after school hours also affect general planning greatly.

Analysis of general circulation in all school plans is dependent, in the first instance, on a realization of the relative importance of various parts, and the inter-relationship of parts; and secondly upon the aspects needed for various rooms; the classroom aspect is, by general agreement, towards the south-east, and this point being settled, the circulations will depend on the relative importance of those rooms to which, at some time during the day, all or some large proportion of the pupils have to go *en masse*, together with the quietness and usability of rooms where classes are held.

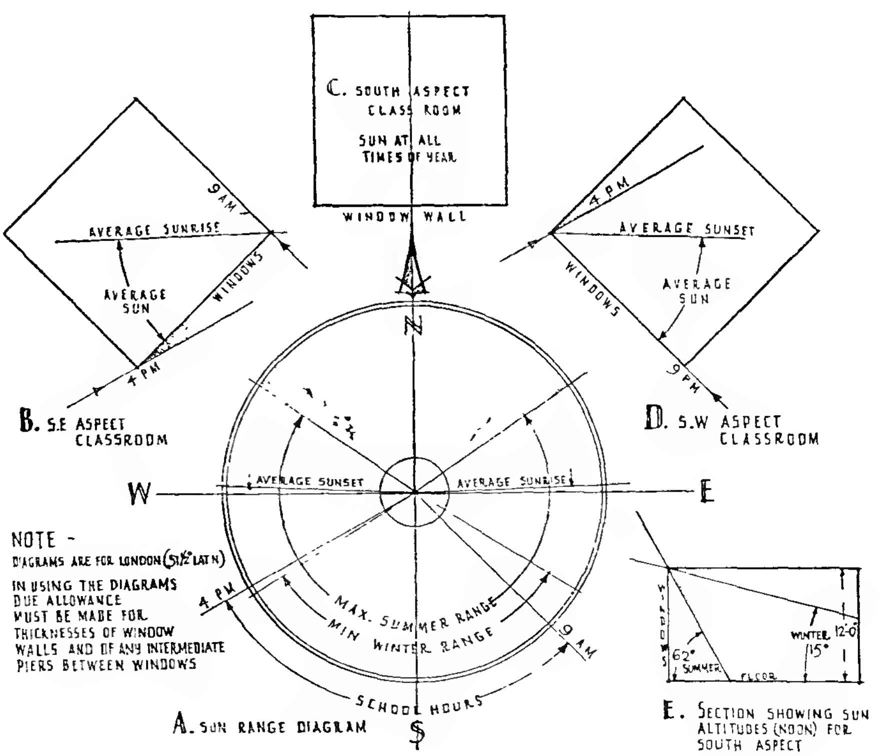


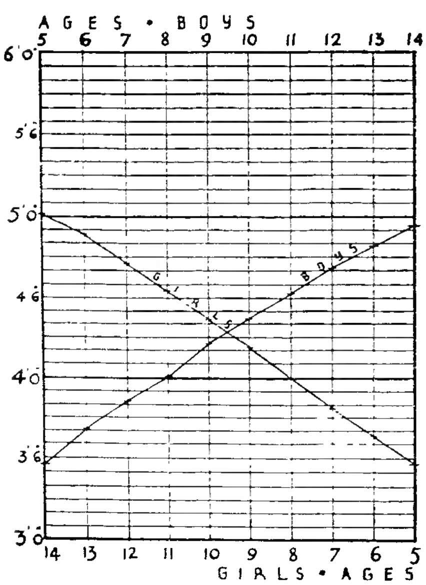

Fig. 3 Sun and aspect diagrams for classrooms

### Height Grouping of Children

The heights of children of age groups in each type or department of a school has considerable influence on the installation and size of equipment and furniture. It must be admitted that in any age group there are wide variations above and below the average height which must be taken into account in regard to seat and desk levels, but are of less importance in relation to other equipment. The dimensions on which Fig. 4 is based are averaged from a number of sources, and heights in different parts of the country may be found to be slightly different.

These average heights must be used for fixing the heights of W.C. seats, cloakroom fittings, towel rails, lockers, and all similar fittings and fixtures. Correct heights of all such fittings are of the utmost importance if full benefit is to accrue. For seating and the working heights of desks and tables the correct height for each child is of the maximum importance to ensure good health and working comfort, and this matter will be discussed in greater detail in later sections on teaching rooms. The heights of children are not given in the figure for ages over 14 years, as for that age and onwards average normal adult height for fittings and fixtures begins to be satisfactory. It should be noted that although in the younger age groups there is little difference in the sizes of boys and girls, in the later years the girls grow more rapidly than the boys, but ultimately, after school age, the boys' average height exceeds that of girls.

Below: Fig. 4 Graph showing average heights of children at various ages




### Corridors

The position of corridors in relation to classrooms varies in different schemes, partly due to local circumstances and also for reasons of site aspect. It is essential to give sunny aspects to classrooms, and therefore corridors are usually on the opposite side of teaching rooms, and in this position provide a protection against cold. Only in exceptional circumstances in which the warmer aspect coincides with the direction from which the prevailing winds blow should corridors be on the sunny side. Open-sided verandas as approaches to rooms were, at one time, very popular and, if used, should be placed on the warmer side of the buildings; this type is on the whole, however, unsatisfactory, and leads to complaints of wind and draughts; it makes classroom lighting more difficult, and is of no value as a protection to classrooms against wind and rain. Widths of corridors should be decided with regard to the number of rooms to be served, but should never be less than 6ft. Good lighting of corridors both natural and artificial is essential. It is sometimes desirable to increase corridor widths as entrances are approached, or where persons from many different parts of the building may need to congregate, as, for example, near the assembly hall. Very long corridors should be broken up at intervals, to reduce draughts and noise, with doors swinging both ways. *Cul-de-sac* corridors should be avoided whenever possible.

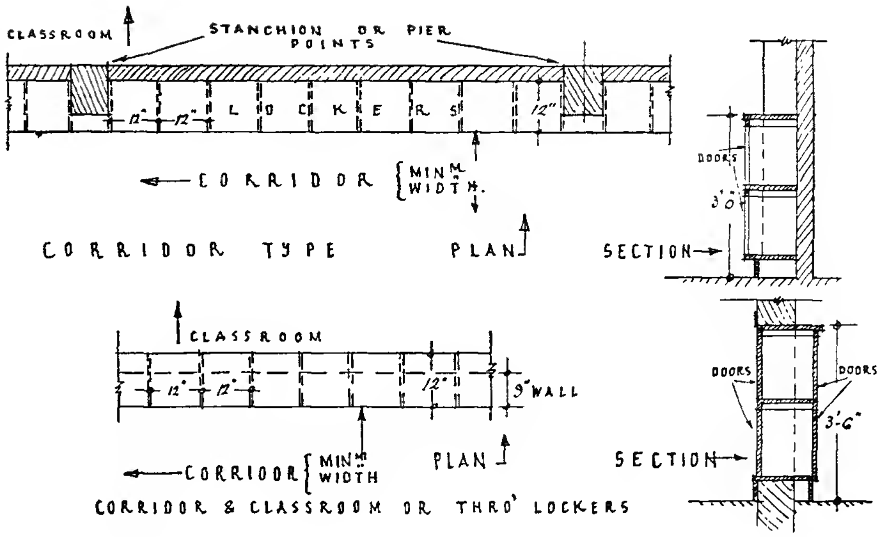
Corridors are often used as exhibition spaces for such articles as models or handicraft work requiring more space than would be occupied by such articles as drawings or pictures hung on the walls: if corridors are to be put to these uses a proportionate width increase is necessary to allow a 6ft. to 8ft. clear circulation space; or, alternatively, exhibition bays may be provided. When students' lockers are provided in corridors, the latter must be increased by the dimensions of the lockers and allow standing spaces for those using the lockers; this is likely to involve an increase of at least 2ft. Rooms from which doors open outwards into corridors must be planned to avoid the doors obstructing the corridors. In other countries, cloakrooms are often formed in corridors and this matter will be discussed in the paragraphs on cloakrooms. With extension of the use of tables and chairs, in lieu of desks, the locker problem is intensified; if table drawers and desk lockers are not provided book storage has to be found elsewhere. There are objections to lockers being placed in classrooms or to the use of desk lockers, in that the pupils must always return to their own classrooms after each lesson-period to put away or change books; nor can a book be fetched from a classroom without disturbance; all these difficulties may be avoided by the provision of lockers in corridors or by planning separate locker rooms or recesses, or if lockers are placed in cloakrooms; the last arrangement is generally the least liked. Lockers for normal book storage purposes need not be more than 12in. overall from back to front, but either width or height should allow for an attaché case or satchel to be placed in the locker, and this needs about 16in. or more. Fig. 5 illustrates two layouts for lockers; firstly, those in recesses, which are formed between piers or stanchions; the lockers are fitted in flush or slightly projecting into the corridor, according to the thickness of the partition in relation to the size of the piers. The overall height of locker fitments should not be too great for children to reach, or when a full glazed partition is used between the corridor and classroom.

The size of book lockers varies considerably according to the grade of school; small lockers 12in. by 12in. by 12in. are adequate for junior classes, increasing to 12in. by 18in. by 12in. and fitted with an intermediate shelf for secondary schools, where students need more and larger-size books, and may have, in addition, instruments or tools. The number of tiers of lockers is dependent on the length of walls available, but lockers must be kept within easy reach, bearing in mind the average heights of the children to use them in each type of school; the lowest row of lockers should be at least 9in. and better 18in. above the floor, and the space so left should be clear of all obstructions to permit easy cleaning.

Lockers should not exceed a height of 5ft. above the floor, except in schools for older pupils, when 6ft. may be used as the maximum. It will be found that while a comparatively low glass level of glazed partitions between corridors and classrooms limits the number of lockers that may be placed in this position, there are many other parts of school buildings where considerably more wall space is available against which lockers may be placed. Lockers on both sides of corridors are not desirable but may become necessary in schools which are used for day and evening students, in order to obtain sufficient wall space. When possible lockers should be placed against the classroom walls and thus opposite windows, as it is difficult to see into lockers placed below external windows. If a scheme of this kind is accepted, the shelf or space above the lockers should not be used except as a place for use in connection with the lockers. The other example shows a substitution of lockers for the partition between the corridor and the classroom in order that books may be available from both sides; any depth of locker may be used in this position, and if greater than the partition wall thickness as shown on the diagram, a useful shelf may be formed on the classroom side.

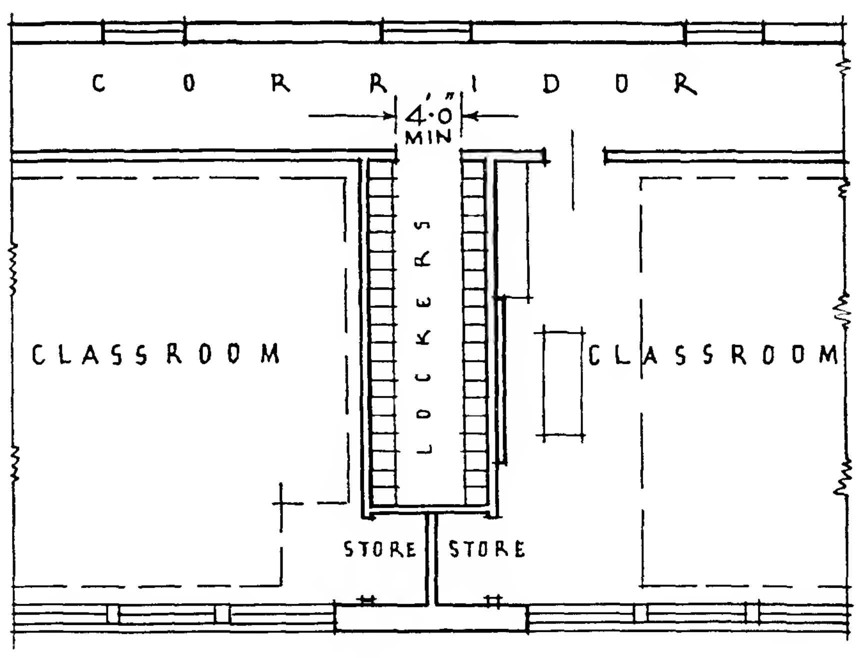
Glazed recesses or cupboards have frequently been installed in corridors of schools in other countries for display purposes; such display cases should be kept well above floor level and the doors should be fitted with locks.

Fig. 6 illustrates a method of providing locker space, without using the corridor itself, by means of recesses designed specially for the purpose. The length of the recess is dictated by the number of lockers required for each classroom and the size of the children using them, as the latter determines the number of tiers. The remaining space forms very useful storage, which may be divided between the two adjoining classrooms. The width of the recess should be such that there is at least 4ft. between the faces of the lockers and a rather greater width of recess is desirable.




Above: Fig. 5 Book lockers in corridors

Below: Fig. 6 Locker recesses of corridors



# STAIRCASES, SERVICE ROOMS, CLASSROOM AND CORRIDOR SECTIONS

### Staircases

In general, separate staircases must be provided for each department. At least two staircases are essential in every multi-storey building; it is desirable that such alternative staircases be at opposite ends of the building, but they should not be more than 200ft. apart, a requirement which may mean that additional staircases have to be provided. Staircases must have adequate daylight and ventilation, which can only be provided by having at least one external wall. Construction must be fire-resisting and of non-slip surface materials; staircases are best constructed of concrete with hardwood treads, or of artificial stone with inserted non-slip strips near the nosings. The minimum width should be 4ft. and the maximum number of steps in a flight should be 14; winders must not be used, nor must landings be broken by steps; short flights of steps are undesirable, as children are apt to jump them. When small changes in level are essential, ramps of very flat gradient should be considered. Treads should be 12in. wide with 5½in. risers, or 11in. treads with 6in. risers. Risers should never exceed 6½in. nor should the going be less than 10in. Flights should not exceed 16 risers or have fewer than three. Continuous handrails should be provided on both sides; handrails must be very rigidly fixed and are better if sunk into the walls, although this treatment is costly. Staircases should be fully enclosed and doors opening on to staircases must be planned to avoid obstructing the normal width of passage. *See also* Part 1: Circulation: "Staircases."

### Caretakers' Cupboards

A slop sink and hot- and cold-water taps at a height convenient for filling pails are required for the use of cleaners, together with suitable storage cupboards for brooms, pails and general supplies. The sinks are frequently placed in the lavatories, but are better if placed in a small cleaner's cupboard with proper ventilation; a window is desirable and for convenience in arranging plumbing services cleaners' facilities should be planned adjacent to sanitary blocks. Large schools should have a number of cleaners' cupboards suitably placed in relation to the various parts of the school, and should have a main store for bulk storage of materials and cleaners' general supplies.

Adequate ashpits, dustbins and garbage bins must be provided in positions accessible to vehicles but at the same time screened from view and inaccessible to the children.

### Heating Chamber

The heating chamber must be carefully ventilated and access to it must be cut off so that pupils cannot enter the room; it is preferable that access be arranged externally to overcome any risk of penetration of fumes into the school buildings. Fuel storage must be adequate in size for the supplies to be delivered in large quantities, and for this purpose convenience to roadways for easy delivery is of the utmost importance. Fuel storage should be properly arranged in relation to boilers to reduce handling of fuel to a minimum. Care should also be taken to ensure that the boiler room is of a sufficient area and height to avoid difficulties in plant layout.

### Meters

Proper provisions must be made for gas and electric meters, distribution boards, fuse boxes and similar apparatus in positions convenient to the entrance of supplies and for easy distribution; they should be so placed as to be accessible only to the caretaker or his staff.

### Heights of Classrooms

The Regulations do not specify minimum heights of rooms, but require various factors to be met which in turn control room heights; of these factors the most important is the provision of a minimum daylight factor of at least 2 per cent on working-surfaces; the other factors influencing the height are the width of the room and purpose to which it is to be put. The Memorandum accompanying the Regulations does, however, suggest that teaching rooms should not be less than 11ft. to the ceiling. Greater heights are, in most situations, unnecessary if the necessary lighting requirements are met. Flat ceilings are generally desirable, but it may be more convenient with some types of construction to provide ceilings at tie-beam or collar level and, if the necessary height is available, to design partial roof or clerestory lighting. Again, it may be possible to start the ceiling at 10ft. above the floor (wall plate height), rising to 12ft. or 13ft. at collar level, so long as the flat ceiling is at least 50 per cent of the room area. It is doubtful under ordinary conditions, when lighting is from one side only, if rooms 11ft. high (with windows reaching to the ceiling) can light adequately across a width of more than 20ft. from the window wall. Clerestory lighting alone, on the side opposite the main windows, without borrowed light between the classroom and the corridor, does not greatly assist general lighting of classrooms; especially does this apply to the row of desks nearest the corridor wall; it is this part of the room that provides the greatest difficulty in respect to meeting the requirements of a minimum daylight factor.

Rooms should not be open to the ridge; flat ceilings under pitched roofs insulate rooms more effectively against outside temperature changes and assist generally the provision of more comfortable conditions. Windows must not be so placed that they are directly in front of the pupils and they must be so placed that the lighting is as even as possible over the whole area of the room.

### Classroom and Corridor Sections

The widths and heights of classrooms have already been discussed in general but the placing of windows and the sectional shape adopted have a material effect on room shapes and lighting. Corridor widths have also been discussed, together with the question of corridor lockers, but again not in relation to the section of the building as a whole. Corridors should be not less than 8ft. in height and in order to obtain direct cross-ventilation to classrooms over corridor roofs greater heights are often inconvenient. Ample window area is essential in corridors, a large part of which should open, more especially if the classrooms obtain cross ventilation from them; such an arrangement is apt to be disturbing to classes, due to corridor noise. Opinions as to whether glazed lights between classrooms and corridors are disturbing to

the pupils varies; many teachers maintain the view that after a few days the pupils take no notice of passers-by.

Figs. 7, 8 and 9 show sections through classrooms and corridors. Fig. 7 A, B and C, and Fig. 9 show single-storey types, and Fig. 7 D and Fig. 8 show multi-storey types. It is generally desirable that direct ventilation be available to classrooms over the corridor as shown in all figures except 7 D. Borrowed lights between classrooms and corridors are widely used and assist the lighting of wide types of classroom; an objection to the use of such lights is that the main light on desks nearest to the corridor is likely to be from the right-hand side and other rows may receive light of equal strength from two directions. Another objection to large borrowed lights is that the wall-space may be wanted for the accommodation of lockers, display boards or bookshelves.

Where rooms are planned on both sides of corridors, as in Fig. 7 C, the corridor must be top-lighted and, in consequence, may not be well ventilated; opening clerestory lights for the classrooms above corridors of this type are, therefore, most essential. Classrooms with partial top or roof lighting are not generally favoured; they usually cause cold down-draughts which are difficult to overcome; also, the cost of maintenance of roof lights, especially cleaning, is high. Vertical lights as shown in Fig. 9 are more easily maintained. When borrowed light across corridors is used sill heights must be kept low to avoid shadows across desktops nearest to them and also because the angle of light is necessarily low from the upper part of corridor windows. Fig. 7 A shows a normal pitched roof over the classroom and a flat roof over the corridor, above which clerestory ventilation is provided for the classroom. Type B shows dormered windows for a similar purpose, but light from these, although thrown well back into the room, may prove to be uneven on the desks as a whole. Type C is not very satisfactory as the movement of air is likely to be sluggish in the small area between the two main roofs. Type D is the most common of the sections used for multistorey buildings; the topmost borrowed lights are usually made to open to provide ventilation between classrooms and corridors. All the lower lights between classrooms and corridors and

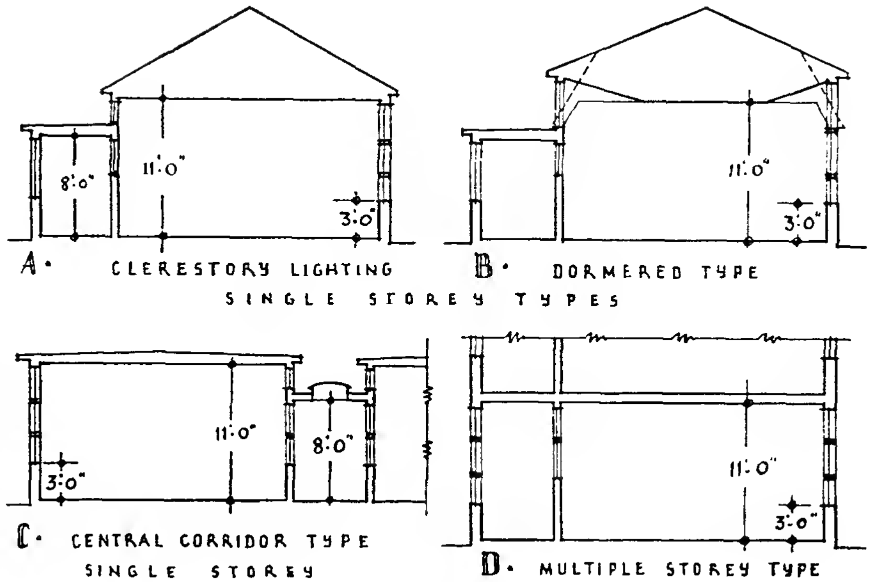
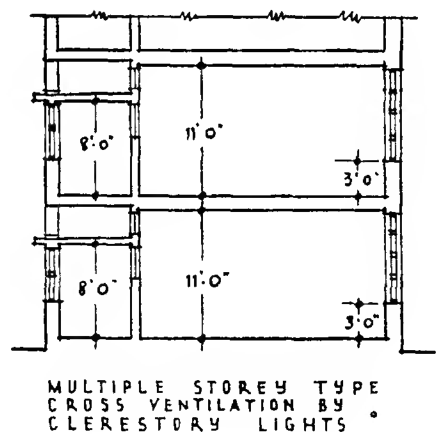
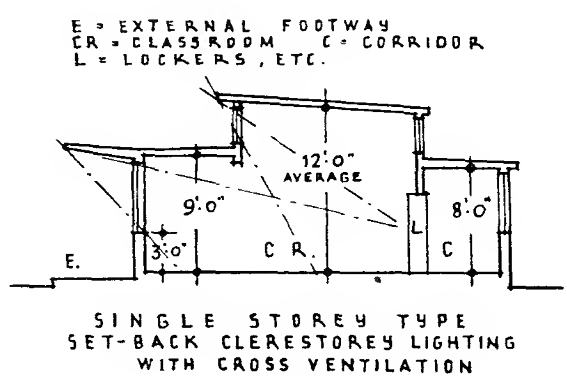



Fig. 7 Classrooms and corridors: lighting and ventilation

Right: Fig. 8 Classroom and corridor sections




Right: Fig. 9 Classroom and corridor sections



all such lights when clerestory ventilation is provided, are usually fixed to avoid dangerous obstructions on either corridor or classroom side. Fig. 7 illustrates an alternative method of dealing with multi-storey buildings to overcome the difficulty of having to ventilate the classrooms through the corridor.

It is based on the cantilevering out of the corridor at each level and roofing them at about 8ft. high. The ventilation would be much more satisfactory but the cost is probably rather high, though this objection may be lessened by the introduction of piers as supports in order to avoid expensive cantilever construction.

Fig. 8 shows a type of section suitable only for single-storied buildings which is specially designed to give even lighting over the whole of the room without dependence on borrowed lights; ventilation is arranged over the corridor roof; this type of section permits the use of corridor walls for lockers, etc., up to any height within reach of pupils. It should be noted that external cantilevered canopies are introduced to reduce sky-glare from the main windows, which is frequently trying to the eyes if rooms having windows of large areas are used. Reference should be made to the Ministry of Works Post-War Building Studies, Report No. 12, " Lighting of Buildings," in which this subject is discussed in great detail with diagrams of light intensities resulting from the use of varying sections for classrooms. From the point of view of good ventilation it is desirable that the heads of all windows should be placed as near to the ceiling as construction will permit.

### Classroom Windows

While no precise sizes are given in the Ministry of Education's Regulations or the " Memorandum," windows are controlled in area by the necessity of meeting the 2 per cent minimum daylight factor and the amount of ventilation required, which is six changes per hour; the latter is generally met by opening windows. The Regulations require one-half of every window area to open and to be so constructed that the amount and direction of the incoming air may be regulated according to the direction of the wind. The windows must be so distributed as to light evenly every desk, and the Memorandum suggests that the lighting should not exceed by more than 50 per cent the intensity prescribed; it is suggested also that by the use of clerestory or top lights, intensities up to 5 per cent may and should be secured whenever possible. The difficulty of installation and the relatively high cost of maintenance, repairs, cleaning and heating of top lights, should be borne in mind, and such types are limited in use to top floors or to single-storey buildings. Windows should be placed at such a level that the pupils can see out when seated, which may be taken as 3ft. from floor to glass-line, except in nursery schools, where a still lower level is desirable. Windows should be so planned that the glass-line of the window farthest from the teacher is on a level with the back of the last row of desks. Heavy mullions or piers are undesirable owing to contrasts of light and dark surfaces. Windows should always be on the left-hand side of pupils if on one side only and if on two sides the strongest light should be from the left side, although the latter may be difficult to achieve if borrowed light from corridors is used, as already noted. Windows should not face either teacher or pupils. Windows should extend as near to the ceiling as is practicable to permit a maximum penetration of light to the far side of the room and also to ventilate the top of the room. Elaborate or expensive fittings or gear for the control of windows should be avoided. Clear glass should be used both in external windows and borrowed lights.

### Types of Classroom Windows

Many types of window have been used for classrooms, of which the most usual are those having a hopper light at the bottom and either a vertical pivot-hung and a horizontal pivot-hung light or two or more horizontal pivot-hung lights above. Another common type is a double-hung sash, with a pivot-hung light over. Double-hung sashes have the fault of not opening more than about half the total area; pivot-hung types with the hopper below are, perhaps, the most satisfactory; incoming air enters near the bottom and can be directed upwards, and the whole of the upper part can be made to open. Hoppers, when used, should have a clear air opening at the top of 4in. and should have side cheeks to direct the incoming air upwards over the heads of the pupils, also the top of hopper lights should be at least 4ft. 6in., and better 5ft. above floor level. Hoppers should not be used for upper lights, as the incoming air strikes the ceiling and causes down draughts. The uppermost lights must open to the full extent for ventilation purposes. Pivot-hung sashes may be opened in wet weather with less risk of rain entering the room than with double-hung sashes and permit maximum opening in hot weather.

The sliding and folding type of window with pivot-hung sashes above has been widely used; it can be opened to the fullest extent: in addition, it has most of the advantages of casements, as it is possible to open a leaf against a side wind from any direction; it has not the disadvantage of opening to the floor and thus cooling the lower part of the room excessively. Full-length sliding and folding windows and similar windows or doors are often installed in nursery schools and in infant departments, but it is probably better to insert a pair of doors in a large window area, since by this means better control of the incoming air and especially floor draughts is possible. Doors are often installed about one or even two steps above the floor level to overcome floor draughts and also to permit heating-pipe runs without the cost and trouble of sinking these below the floor level. An objection to any form of window reaching to the floor is that heating pipes and radiators have to pass across them. Doors and full-length windows do, however, permit very low glass-lines, which are desirable for small children.

Borrowed lights between classrooms and corridors are usually fixed except when ventilation from the corridor has to be provided and then the top part of the light is usually horizontally pivot-hung.

Clerestory lights or ventilators should be of horizontally pivot-hung type.

Care should be taken when windows of the casement type are installed on the ground floor to avoid external opening projections below the height of persons. If windows overlook playgrounds, flower beds and, better, guard rails should be used near the buildings if the lower edges of the open sashes are less than 6ft. 6in. above ground level.

### Doors to Classrooms

Doors should be at least 3ft. wide and should have the upper part glazed to permit supervision without entering the room. Frequently pairs of doors are installed, but these are held, by some authorities, to be a nuisance and even dangerous. Doors should be placed near the teacher's end of the room for proper control. Access to store-rooms attached to classrooms, when provided, are also better if placed at the teacher's end. The use of flush doors for schools has increased in recent years; the flat surfaces are more easily cleaned, but it is important to select only those types which are solidly built and have well-protected edges, as wear and tear is heavy in school buildings.

### Teacher's Wall

The wall at the teacher's end of the room has to carry certain of the teaching equipment. The equipment varies according to the use of each room. The most important piece of equipment is the chalkboard; it may be one of several types, of which the most common is a long sectional board in two, three, or even more sections, fitting into a fixed rack; lengths of 9ft. and 12ft. are usual. Other types are vertical boards about 4ft. or 5ft. wide, and 8ft. to 10ft. high; a development of the vertical type of board is the continuous flexible revolving type, with similar dimensions to those of the normal vertical types. Fig. 10 A illustrates a typical fixed sectional chalkboard; these are usually at 3ft. 3in. or 3ft. 6in. above the floor, and are about the same height overall, the sectional boards being usually about 3ft. high. When reversible chalkboards are used they should not be too large in area or too heavy to handle easily; a width of 3ft. is probably better than the 4ft. width which has been often used. Chalkboards about 3ft. square can be adapted to suit unit fittings, as suggested in Fig. 10. Diagram B on the figure illustrates the vertical sliding chalkboard. Unit-type fittings which are interchangeable permit of varying the storage accommodation in classrooms to suit the special needs of each class or subject; the unit fittings illustrated in Fig. 10 include cupboards, open shelving, and notice boards. Open shelving seems rather undesirable near chalkboards owing to chalk dust, and should not be placed under the chalkboards. Cupboards and shelving are usually required in two depths of about 9in. and 14in. Cupboards and shelving are of no value if the height exceeds 6ft. 8in. overall; and, in fact, height over 5ft. 6in. are only of limited value.

Platforms for the teachers are not provided in normal classrooms in more recently equipped schools.

### Materials for Classrooms

Floors should be constructed of fire-resisting materials; in the case of single-storey buildings the floor finish should be laid directly on the surface concrete. The most common type of flooring is wood blocks (hardwood is not necessary) laid in mastic; tongued and grooved boarding is also widely used, secretly nailed to fillets embedded in the concrete. Cork, linoleum, rubber and similar jointless materials have been laid directly on the concrete, but with many such materials the cost is high and the maintenance also may be high. Floor materials should be selected to be as silent as possible, easy to clean, and capable of withstanding frequent washing and hard wear arising from moving desks. Walls should be finished, at least to dado height, with materials which will stand frequent cleaning, hard knocks and rough usage, but such materials are difficult to select. Tile and brick are generally unpleasant in appearance, although hard-wearing and requiring little upkeep; even hard plaster may need frequent painting and repairs. Plywood and leather cloth have been used with some success. The upper parts of classrooms are usually plastered and distempered; colour-washed brickwork has also been used, although it tends to be noisy.

Great care should be taken to select partition materials so as to avoid the passage of sound from one classroom to another and the planning of stores between classrooms is very helpful in reducing sound transmission.

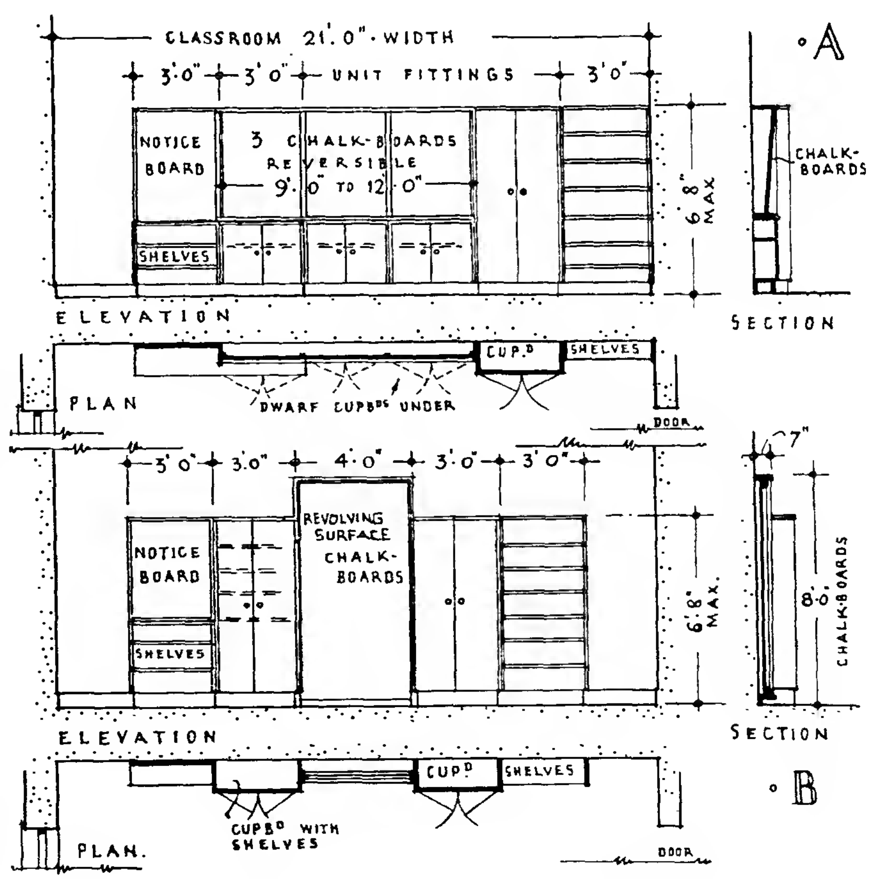


Fig. 10 Fittings for the teacher's wall

NURSERY SCHOOLS: SCOPE, SITES, PLAYROOMS, CLOAKROOMS, LAVATORIES

### Scope

This section is concerned with schools for children between the ages of two and four (inclusive), referred to in the Education Act, 1944, as nursery schools. "The Standards for School Premises Regulations," 1951, set out those regulations which should be adhered to in the design of schools and these are referred to in this section.

### Sites

The site of every nursery school has to include a garden playing space and should be $\frac{1}{4}$ acre for up to 40 children, with an additional $\frac{1}{8}$ acre for every 20 children or part thereof. The garden playing space should not be less than 100sq. ft. for each child of which 40sq. ft. should be paved. Part should be covered by a roof and the remainder laid out with grass, flower-beds and paths. Sandpits, under supervision, are an asset for nursery classes and should be provided; the details of these are given in Part 1: Recreation.

### Accommodation

Each nursery school should provide 25sq. ft. of playroom for each child and a separate playroom for children under three years of age.

### Nursery Playrooms

Rooms with a south-east aspect are especially desirable. Large windows reaching nearly to the floor should be used so that the youngest children may see out. Easy access to the garden and play space is very necessary; this may be provided by the inclusion of pairs of doors in the windows or by the use of sliding and folding windows reaching to the floor; whichever system is used great care should be taken to design the windows or doors so that they are draught-proof.

Furniture consists of small light-weight tables and chairs suited in size to the age-groups of the users: the light weight should be related to the ability of young children to move the tables from the nursery to the outdoor play space without assistance. The tables are often single tables about 20in. by 20in., but more frequently dual tables about 20in. by 40in. are used; it is desirable that the tables and chairs be nested.

The floor finish is of the utmost importance, as the children sit or crawl on it while playing, and consequently materials such as rubber, cork or linoleum should be used as a covering in place of the usual classroom boarded floors.

Part of the wall area should be covered with a chalkboard dado on which children may draw. A number of built-in cupboards is essential in the nursery for the storage of apparatus and toys, and at least a part of this accommodation must be on a level at which it is accessible to the children.

A toy store adjoining the room or opening directly from it is desirable for large toys which cannot be kept in the cupboards in the room. A bed store is also needed for the rest beds used during afternoon rest periods; these beds are usually of light metal frames with wood or canvas covers about 4ft. 6in. long by 2ft. wide and designed to nest.

There should be direct access from nursery room to lavatory; the latter should include the W.C.s, and adjoining the lavatory should be the children's cloakroom.

It is desirable that a kitchenette be provided in conjunction with the nursery or group of nursery rooms, in which milk and water may be heated at lunch-time, and from which the midday meal may be served, as the children sometimes take the midday meal in the nurseries. This kitchenette has educational value, and through the provision of equipment such as draining boards and sinks of suitable heights and sizes the children not only do much of the work but learn to handle various types of objects under a teacher's supervision.

Fig. 11 illustrates a typical nursery unit comprising playroom, lavatory, cloakroom, bed and toy stores. This unit may be repeated as frequently as is necessary.

It is usual to have nursery classes not exceeding 40 and to separate the older children from the younger. A kitchenette is shown adjoining the nursery playroom, but if several nurseries are provided this does not require duplication. This kitchenette provides a sink and cooker for adult use, and other sinks and china cupboards at levels which are suitable for the use of the children.

### Cloakrooms

The cloakroom should be adjacent to or adjoining the nursery hall, but it must be a separate room; it is advantageous if the cloakroom is also planned near the garden play space. As in all schools, each pupil must have a separate peg or hanger for clothes; these are sometimes separated by wood or metal partitions forming shallow recesses. Instead of numbers being given to the pegs, pictorial signs are often used for the youngest children. Pegs should be from 30in. to 36in. from the floor, and should be 12in. apart. It is usual to insist on the changing of boots and shoes, and a shoe-cage should therefore be provided for each child; the latter should be large enough to receive a child's rubber Wellington boots. Owing to the low level at which the pegs have to be fixed, the seats and shoe-cages are sometimes placed separately. Floors must be finished with easily cleaned impervious materials and the walls should be treated in a similar manner to a height of at least 5ft. above the floor level.

### Lavatories

It is essential that lavatories be ample in area to allow free movement and supervision: the lavatory should adjoin the nursery room. Ample and properly arranged lighting, both natural and artificial, is most important, in addition to good cross-ventilation. Basins must be provided at the rate of one for every five children under five years. The heights at which basins should be fixed are 18in. for the youngest children and 20in. and 22in. for the older children. Basins should be about 12in. back to front and 18in. long, with the taps placed at the sides so as to be within the short reach of the pupils of these ages. Hot and cold water are essential or, even better, warm water at a controlled temperature not exceeding 140° F. The basins may be arranged in the centre of the room or against the outer walls; the former position is probably to be preferred, although more costly in plumbing, but it leaves the walls free for towel fixtures, toothbrush- and mug-holders, hair-brushes, etc. Movable towel-racks are sometimes provided so that they may be used externally for drying in the sun.

Separate towels for each child are essential. A large Belfast-type sink for use as a bath should be provided for every 40 children under five years; this sink should be fixed so that the underside is about 22in. from the floor.

Fig. 12 illustrates a typical arrangement of a nursery school lavatory and it should be noted that as an aid to supervision the W.C.s are placed in the same room.

A cupboard for the teacher's use, to contain first-aid materials and other necessities, is desirable in the lavatory. Occasionally a foot bath is also provided; this is generally a large Belfast sink placed on the floor with a seat on one side.

Lavatories should have the walls finished with impervious materials to a height of at least 5ft., and preferably the full height of the room. Floors should be of hard, easily cleaned materials, which are not affected by constant wetness and frequent washing.

Whether planned as a part of the lavatories or not, the W.C.s should be indoors and near the nursery; but if for any reason, other than lack of a water supply, the W.C.s have to be planned elsewhere, there should be at least one W.C. near the classroom. The closets should be provided at the rate of one for every ten children and one chamber sluice for every 40 under five years. The heights of closets should be suitable for the varying ages of children; the seat heights should be 8in. for the youngest, 10in. for those about five years old, and 12in. if children are retained in nursery classes up to the age of eight years. These small closets have usually been provided with seat pads, but open fronted plastic seats are to be preferred. W.C.s should be 2ft. 6in. wide in the clear. One W.C. should be provided without a door, otherwise doors should be 3ft. high and hung 6in. clear of the floor and be without fastenings, but for children over five years doors should be 4ft. 6in. high. Partitions need not be higher than the doors, although to obtain stiffness, rigidity and simplicity of fixing the framing will need, in part at least, to be higher, especially across the doorways, to permit access for adults. Care should be taken to provide the " pull " of the flushing apparatus within reach of the children; moreover rapid-filling flushing-cisterns or, better. trough-type cisterns are most essential.

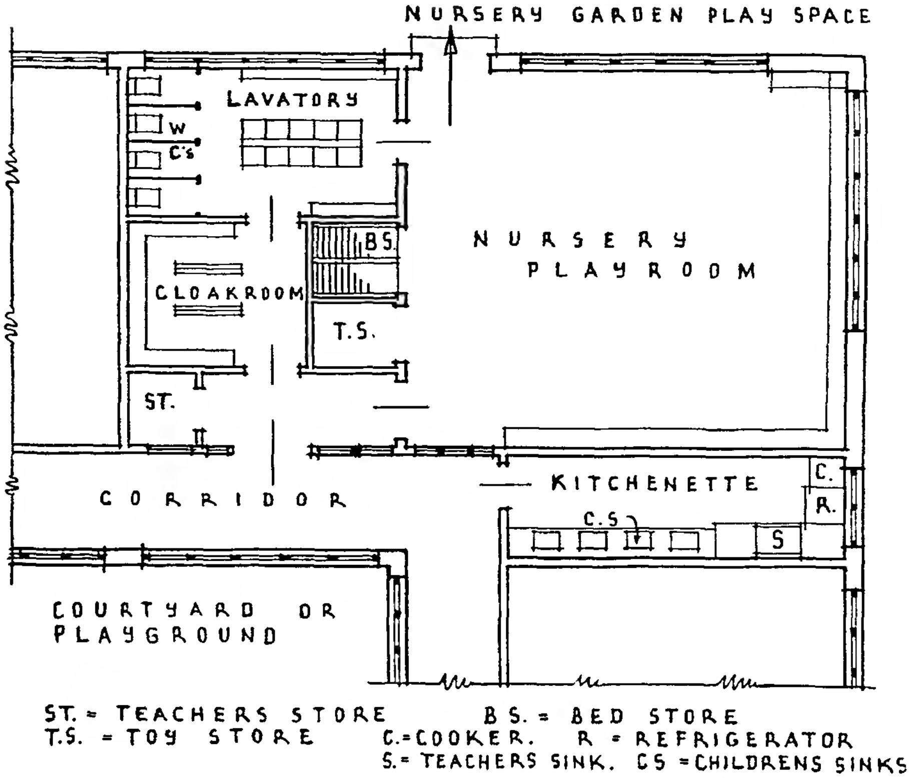



Fig. 11 Nursery school playroom unit

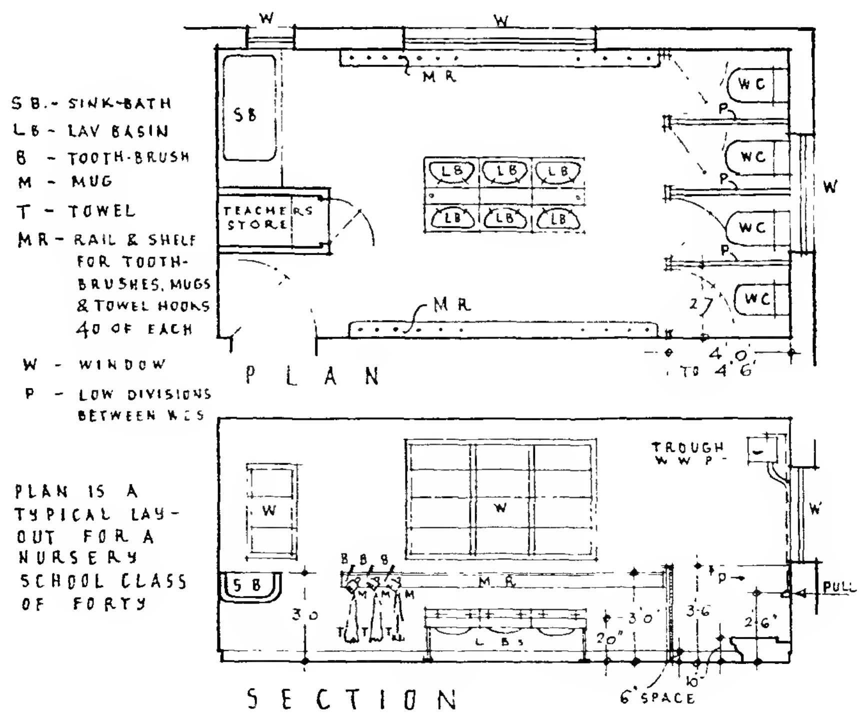



Fig. 12 Nursery school lavatory data

## PRIMARY SCHOOLS: SCOPE, SITE

### Scope

This section is concerned with schools for children between five and eleven years (inclusive): children between five and seven being referred to as " infants " and between seven and eleven as " juniors." The combined categories of infant schools and junior schools comprise the group referred to in the Education Act, 1944, as primary schools. " The Standards for School Premises Regulations," 1951, set out those regulations which should be adhered to in the design of schools and these are referred to in this section.

### Sites

School sites need to be chosen to provide the following factors: easy access from the homes of the children, quietness, sufficient area to provide adequate playgrounds and suitable orientation for the majority of rooms. Sites should be selected bearing in mind future developments under town-planning schemes. In the case of very young children, it is helpful if the school may be reached without crossing busy traffic roads, while for schools for older children, where the pupils are drawn from a wider area, convenient access by train, tram and omnibus is most essential; quietness is essential to permit of undisturbed working, so that close proximity to main roads, railways and noisy factories should be avoided. Thought should also be given to possible adjacent future developments which might be detrimental to a school. While convenient road access is needed, it is wiser to avoid placing entrances on main roads, in view of the possibility of children running out of the school grounds, without warning, into rapidly-moving traffic; a suitable treatment of entrances provides a pause between the gates and the footway and road. The outlook from buildings should be pleasant and value should be set on trees and other natural features; special consideration should be given to this matter in urban areas. Close proximity to public parks and playing fields is an advantage, more especially if play-ground areas attached to schools have to be small owing to the high cost of urban land.

Sites selected should be reasonably level, naturally dry, and preferably without excessive road frontage. Sloping sites involve considerable cost in building and particularly in the laying out of play spaces. If there is a fall it should be towards the south or south-east. It is unnecessary in spread-out types of plan, having regard to economy, to maintain the same floor levels throughout.

When placing the buildings on the site, consideration should be paid to annoyance caused to surrounding houses by noise from school play-grounds and, if opportunity permits, the school building should form a screen.

### Area of Site

The Regulations specify the areas of school sites, which are tabulated on the opposite page.

### Access

Access for vehicular traffic is essential for deliveries of supplies, including food and fuel and for removal of garbage. Roadways should be laid to easy gradients, properly drained and kerbed. Adequate turning spaces properly planned near service entrances are essential for delivery vehicles.

### Services

The availability of services, particularly water and facilities for disposal of sewage, should be given very special attention in the choice of sites. If public services are not available sufficient area for disposal of sewage is essential, and it should be noted that whole Sections (42 and 43) of the Regulations are devoted to very specific requirements relating to water supply and sewage disposal.

### Planting: Trees, Gardens, etc.

The surroundings of schools should be pleasantly treated, and laid out with shrubs, grass and properly constructed and drained paths; paths and roadways should be suitably surfaced to prevent mud being carried into the buildings in wet weather.

Natural hedges should be used where possible, existing trees retained; fences, when needed, should be simple and unclimbable. The lay-out of the site should be kept very simple to allow for easy maintenance.

### Cycle Storage

Provision should be made for the storage of cycles for staff and children: the number of children cycling to school varies according to the neighbourhood. For sizes, etc., *see* Part 1: Transport.

### Playgrounds

Playgrounds should be placed slightly away from school buildings, the intermediate space being reserved for school gardens and open-air teaching. Play-grounds should be paved with hard, dry and even surfaces, with slight falls to avoid central gullies; the paving materials suggested are tarmac, asphalt or concrete, which are clean and dry quickly, and also are satisfactory surfaces for marking games courts. Any surface liable to become dirty or dusty should be avoided. Separate playgrounds are preferred for infants in combined schools for infants and juniors, and such separation is essential if there are nursery classes; infants, when separated, should have a hard paved area at least equal to half the area of a court. Easy access from play-grounds to lavatories and W.C.s is essential.

Proper provision should be made for drinking-water near playgrounds. Drinking-fountains should be fixed at suitable heights for the size of the children, namely:—

- 5 to 8 years—22in. to 24in. off the ground.
- 8 to 11 years—24in. to 26in. off the ground.

### Area of Playground

The Regulations specify the areas of playgrounds, which are tabulated on the opposite page.

### Playing Fields

Playing fields should be provided except for children under seven. If possible they should be provided adjoining the schools themselves, but

in many areas this may be quite impossible, and playing fields must thus be obtained in accessible positions. It is sometimes convenient to assemble together the requirements of several schools, and this may permit of a reduction in total areas needed. Juniors normally play games in small groups and only in the top classes do they normally play national team games.

### Changing Facilities

At the present time it is difficult, within the total cost permitted for a school, to provide adequate facilities for changing and washing after games: every effort should be made however. In addition to normal provisions, which are mentioned later in this section, special provision should be made for storing and drying games clothes, and for washing: footbaths and showers are really essential. For juniors the footbath should be a long narrow trough with a seat along one side.

### Playsheds

A valuable addition to the normal rooms and playgrounds in a school, is a covered playshed. Although at present playsheds are seldom included in schools, this is largely due to lack of money. Playsheds should be as large as possible, and apart from their obvious use for play they can, if a suitable aspect is provided, be used for outdoor teaching in summer. Care should be taken to ensure an adequate fall on the floors to drain any rainwater which drives in, from the inside of the building as quickly as possible.

### Roof Playgrounds

In very crowded urban areas roof playgrounds can be used to supplement normal playgrounds. They must have easy means of escape and should be securely enclosed to prevent children climbing parapets and to control balls and the like.

## TABLES SHOWING MINIMUM AREAS FOR SCHOOL SITES, PLAYGROUNDS AND PLAYING FIELDS

**Infant Schools**

| No. of classes | No. of pupils | Playground area | Site area | Playing field area | Total area |
|---|---|---|---|---|---|
| | | ft. | | acres | |
| 3 | 120 | 110 × 60 | 7/8 | Nil | 7/8 |
| 4 | 160 | | 1 | | 1 |
| 5 | 200 | | 1 1/8 | | 1 1/8 |
| 6 | 240 | | 1 1/4 | | 1 1/4 |
| 7 | 280 | | 1 3/8 | | 1 3/8 |
| 8 | 320 | 2 @ 110 × 60 | 1 1/2 | | 1 1/2 |
| 9 | 360 | | 1 5/8 | | 1 5/8 |

**Junior Schools**

| No. of classes | No. of pupils | Playground area | Site area | Playing field area | Total area |
|---|---|---|---|---|---|
| | | ft. | | acres | |
| 3 | 120 | 110 × 60 | 7/8 | 1 | 1 7/8 |
| 4 | 160 | 145 × 110 | 1 | 1 1/2 | 2 1/2 |
| 5 | 200 | | 1 1/8 | | 2 5/8 |
| 6 | 240 | | 1 1/4 | 2 1/4 | 3 1/2 |
| 7 | 280 | | 1 3/8 | | 3 5/8 |
| 8 | 320 | 1 @ 110 × 60<br>1 @ 145 × 110 | 1 1/2 | 3 | 4 1/2 |
| 9 | 360 | | 1 5/8 | | 4 5/8 |
| 10 | 400 | | 1 3/4 | | 4 3/4 |
| 11 | 440 | | 1 7/8 | | 4 7/8 |
| 12 | 480 | | 2 | | 5 |

**Junior and Infant**

| No. of classes | No. of pupils | Playground area | Site area | Playing field area | Total area |
|---|---|---|---|---|---|
| | | ft. | | acres | |
| 1 | 25 | 110 × 60 | 1/2 | 1/2 | 1 |
| 2 | 50 | | 3/4 | | 1 1/4 |
| 3 | 70 | | 7/8 | | 1 3/8 |
| 3 | 100 | | 7/8 | 1 | 1 7/8 |
| 4 | 120 | | 1 | | 2 |
| 5 | 150 | | 1 1/8 | | 2 1/8 |
| 4 | 160 | 145 × 110 | 1 | 1 1/2 | 2 1/2 |
| 5 | 200 | | 1 1/8 | | 2 5/8 |
| 6 | 240 | | 1 1/4 | | 2 3/4 |
| 7 | 280 | | 1 3/8 | | 2 7/8 |
| 14 | 560 | 2 @ 110 × 60<br>1 @ 145 × 110 | 2 3/4 | 3 | 5 3/4 |

PRIMARY SCHOOLS: PLAN ANALYSIS, TEACHING ACCOMMODATION, COMMUNAL ROOMS

### Space Requirements

Primary schools can be divided into four parts for the purpose of analysis: class spaces with their coat-hanging and sanitary accommodation, each of which is allocated to a class of children; the spaces used by all children such as the assembly hall, dining-room and entrance hall; the administrative rooms, which include the head teacher's room, medical inspection room and staff room; and lastly the service rooms such as the kitchen, boiler-house and so on.

### Teaching Accommodation

The Regulations set down the required areas for the assembly hall, the minimum size for any classroom and " other areas ": these are tabulated in the adjoining column.

### Relationship of Rooms

The common or shared spaces, assembly hall and dining-room, are the core of a primary-school plan: the class spaces and their coat and lavatory accommodation are normally arranged around them. Recently schools have been planned so that the access to class spaces is through other class spaces; this can have no educational advantage and should be avoided except where it is essential on grounds of cost. Even then, no more than one class of children should ever have to pass through any other class and then not through the main teaching area. Similarly, access to classrooms from the outside, when children have to put on raincoats to go out in the rain, is most undesirable and should be avoided. The relationships of other spaces are considered later in this section.

### Entrance Space

The character of the entrance of schools has changed since the war. Whereas previously it was normal to have separate entrances for the staff, for girls and for boys, it is now normal practice to have only one entrance. This arrangement is to be preferred to the old, it eases the design problems and in practice has worked well. In mixed junior and infant schools, however, there is a case for providing a separate

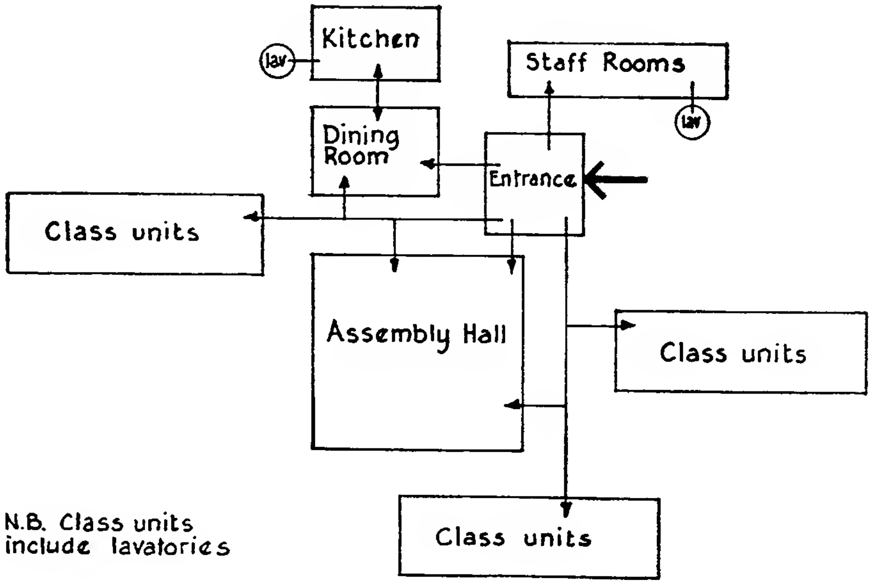



Fig. 13 Typical plan analysis

MINIMUM AREAS FOR PRIMARY SCHOOLS

| Size of school | Teaching accommodation (sq. ft.) | | Minimum size of any classroom (sq. ft.) |
|---|---|---|---|
| | Hall area | Other areas | |
| One class | — | 1,000 | 400 |
| Two class | — | 1,500 | 400 |
| Three class (not exceeding 70 pupils) | 1,000 | 1,200 | 400 |
| Four class (not exceeding 100 pupils) | 1,500 | 1,600 | 400 |
| Five class (not exceeding 150 pupils) | 1,800 | 2,250 | 450 |
| Three class One form entry Infant | 1,200 | 1,560 | 520 |
| Four class One form entry Junior | 1,800 | 2,080 | 520 |
| Five class | 1,800 | 2,600 | 520 |
| Six class Two form entry Infant | 1,800 | 3,500 | 520 |
| Seven class One form entry Infant and Junior | 1,800 | 4,000 | 520 |
| Eight class Two form entry Junior | 1,800 | 4,600 | 520 |
| Nine class Three form entry Infant | 1,800 | 5,050 | 520 |
| Twelve class Three form entry Junior | 2,000 | 6,800 | 520 |

entrance for the infants leading direct to their class spaces and cloakrooms.

Allowance should be made in the entrance space for exhibitions, notices and so on. Since the entrance is now used by many more people it should be generously planned. Adjoining rooms frequently open directly off the entrance space, and it is advisable, therefore, to provide a draught lobby for the entrance doors.

### Assembly Hall

The assembly hall in a primary school is used for many purposes; for formal assembly, such as religious worship, and for singing, dancing, games and exercises. In addition, it may be used by adults after school hours if there is no other hall available in the neighbourhood. Requirements for adult use will vary from those for children but should not take preference over them. The trend in designing halls, as indeed in the designing of the rest of the school, is for informality. Children sitting in a circle singing or dancing, require a space nearly square and never having a width less than two-thirds of its length.

### Equipment of Hall

Formal fixed stages are not required: for infants they are entirely unnecessary, and for juniors movable platforms made up in units of about 1ft. 4in. by 2ft. 8in. by 1ft. 4in. allow for dual use: they can be arranged formally for assembly but can also be used for games and for informal acting and so on.

In some schools the hall is used for exercises and simple equipment is provided for this use; this requires to be put away at times and it is essential, therefore, to provide a store adjoining the hall.

### Access to the Hall

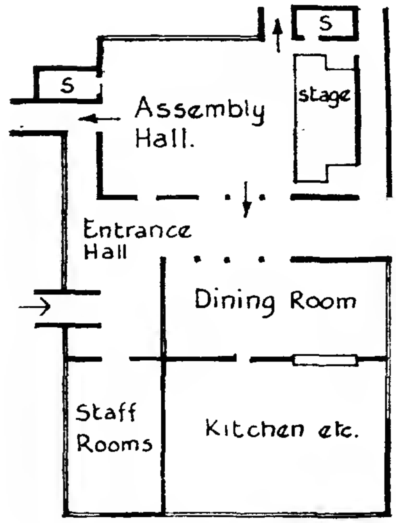
In order to avoid congestion there should be several entrances to the hall, one from each group of class spaces, and also easy access to lavatories.

### Dining-Room

Since this room is mainly used between twelve and one o'clock it should be so placed as to catch sunlight at that time. Normally children should sit at small tables, which they can serve themselves as they do at home. The tables and chairs should be light and stackable for the dining-room may be required for other purposes at other times of the day. Dining-rooms are inclined to be noisy and care should therefore be taken to provide ample sound absorption.

### Relation of Assembly Hall and Dining-room

There are many occasions, when the dining-room is not being used for eating, when the two rooms can be used jointly and it is advantageous if the two rooms adjoin each other. They can have sliding or pivoting doors between them, so that the two rooms can be thrown into one.




Above: Fig. 14 Typical dining-room and assembly hall

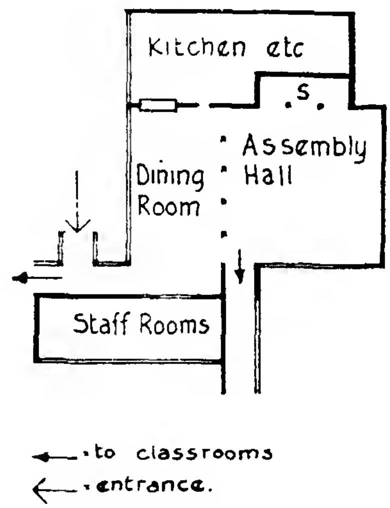



Fig. 15 Typical dining-room and assembly hall

## PRIMARY SCHOOLS: CLASS SPACES, SANITARY ACCOMMODATION

### Relationship of Class Spaces to Sanitary Accommodation

Two of the possible relationships between teaching spaces and cloakroom and lavatory accommodation are: firstly, to provide grouped sanitary accommodation for two or more class spaces and, secondly, to provide individual sanitary accommodation for each class space.

The emphasis in planning for young children to-day is to give each class of children its own self-contained unit. This arrangement is particularly suitable for infants who need constant supervision. Fig. 17 shows a typical class space with its own sanitary accommodation, while Fig. 16 shows grouped sanitary accommodation for several class spaces.

### The Class Space Unit

Each class will require in addition to the actual teaching space: a small area for practical work (puppet making, bookcraft and so on), a small paved area for outside teaching and games, an area for hanging coats, and two small lavatory units, one for boys and one for girls. Each of these areas will be considered in turn. A typical plan for such a class space unit is shown in Fig. 18.

### Teaching Space

The minimum areas for teaching spaces have already been given earlier in this section (page 212). In this space it should be possible to teach both formally and informally; to hold the attention of all the children in a class at one time and to allow the children to work individually or in small groups. It is not necessary for the teaching area to be square or rectangular and indeed it is often an advantage if it is a more irregular shape.

Each teaching space will need pin-up board for use by the children; for infants this should be 2ft. from the floor and for juniors 2ft. 8in. A locker should be provided for each child approximately 10in. by 7in. by 6in. for infants and 13in. by 8in. by 6in. for juniors. In addition, a store-room or large cupboard will be needed for books and materials. Other fixed equipment should include a chalkboard (this can be mobile), bookshelves, display cupboards and so on.

For infants tables will be required, either rectangular (3ft. 0in. by 1ft. 6in. min.), or for instance, trapezoidal. For juniors individual desks are to be preferred (1ft. 8in. by 1ft. 5in. min.). Larger sizes are probably desirable but it will be found difficult to accommodate increased sizes in the areas laid down in the Regulations. Dual tables or desks should be 44in. and 40in. long respectively.

The floor space needed for a single desk with a loose chair should be 1ft. 8in. by 3ft. using the table sizes mentioned above; but it may be found necessary to reduce this to minimum sizes of 1ft. 6in. by 2ft. 8in.

The selection of seat and writing-surface heights should be based on providing for the feet to be flat on the floor, with the lower part of the leg vertical and the upper part horizontal, the back upright, with support in the small of the back and just below the shoulders. The edge of the writing-surface can be almost directly over the front edge of the seat. All furniture should be movable and consequently not too heavy, which is an objection to types having locker-tops.

Dimensional surveys for school furniture have been carried out for a British Standard which is being considered but has not, as yet. been published.

### Practical Space

One part of the class space unit should be set aside for practical work and this is a reasonable place to position a sink and draining board which is essential in any classroom.

This area should also be provided with a work-bench; and one or more strong unpolished tables (approximately 6ft. by 2ft. 6in. in size) should be provided.

### Spaces for Hats, Coats and Shoes

These are best positioned in each class space unit so that children can easily put on their outdoor clothes in order to go out to play in winter. Provision should be made for drying the clothes and if necessary a separate drying room should be provided elsewhere in the building.

### Outdoor Space

Opening directly out of the teaching space should be a paved area and children's garden, which should be equipped with benches and even, if possible, a sandpit or paddling pool for the very small children.

### Sanitary Accommodation

The regulations require the following sanitary fitments in schools:

*Lavatory basins*

| | | |
|---|---|---|
| For the first 30 pupils | .. | 4 basins |
| For each additional 15 pupils (up to 300) | .. | 1 basin |
| For each additional 30 pupils (over 300).. | .. | 1 basin |

*W.C.s (girls)*
One W.C. for each lavatory basin.

*W.C.s and Urinals (boys)*
One fitting (either W.C. or urinal) for each lavatory basin.

A typical lavatory unit is shown in Fig. 16. Hygiene is one of the subjects taught or implied in primary education and it is essential therefore to provide lavatory basins adjoining all W.C.s and urinals.

### Heights

As has been stated, dimensional data, for use in designing schools, are being prepared as a British Standard; in the meantime provisional suggestions for the heights of equipment, etc., are indicated in Fig. 19.

### Sunlight

Provision should be made for class spaces to receive sunlight throughout the school day.

### Daylight

A minimum of a 2 per cent daylight factor is required.

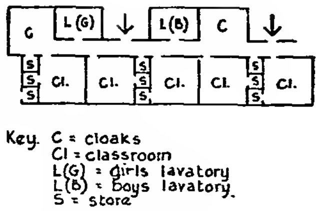
### Artificial Light

A large number of small fittings is to be preferred.

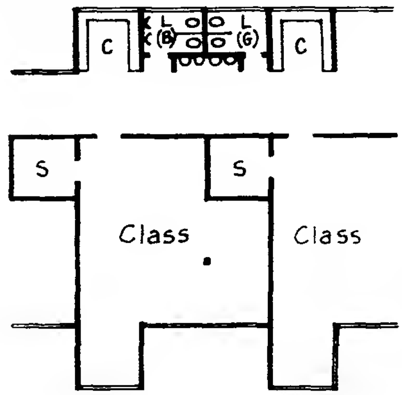
## PRIMARY SCHOOLS: CLASS SPACES, SANITARY ACCOMMODATION, ADMINISTRATIVE ROOMS

### Head Teacher's Room

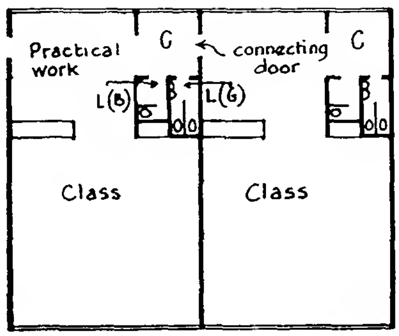
In every school with a staff of more than five persons there has to be a separate room for the head teacher. This room should be near the school entrance and easy to find by visitors. The head teacher will require a private lavatory and W.C., adjacent to his room. Adjoining the head's room there should also be a room for a secretary, although in small schools the secretary may only be employed part-time.



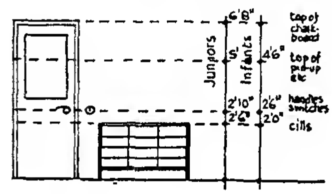

Above: Fig. 16 Grouped sanitary accommodation




Right: Fig. 17 Independent class space




Left: Fig. 18 Class unit



Below: Fig. 19 Various heights for children

### Staff Room

The common room for the staff needs to be placed in a quiet position, preferably near the centre of the school. Furnishing is of a domestic kind and armchairs, writing-desks and notice boards will be required. Nearby should be the staff's cloak space and lavatories.

### Stock Room

It is an advantage if this room can be placed near the staff room for easy access.

### Drying Room

Few schools at the moment are provided with a drying room, but such a room is really a necessity in any school. Children's clothes do get wet through on occasions and it is only reasonable that there should be provision for drying them.

### Doctor's Room

This room which is only used periodically can, in small schools, be used also for other purposes. It should allow space for eye-testing (21ft.) and in addition provision must be made for a wall-light point (for the eye-testing chart) a basin with hot water, and a power point for sterilizing apparatus. Nearby there must be sanitary accommodation and space for parents and children to wait in comfort.

## SECONDARY SCHOOLS: SCOPE, SITES, PLAYGROUNDS

### Scope

This section is concerned with schools for children over 11 years of age where secondary education is provided mainly for pupils taking a five-years course, as referred to in the Education Act, 1944. " The Standards for School Premises Regulations," 1951, set out those regulations which should be adhered to in the design of schools and these are referred to in this section.

### Sites, Services and Planting

The general considerations for the selection of sites, availability of services and provision of planting have been outlined in the section on " Primary Schools." Reference should also be made to Part 1: Sites.

### Area of Site

The Regulations specify the areas of sites, which are tabulated in the adjoining column.

### Playgrounds

Playgrounds should be placed slightly away from the school buildings: the intermediate space may be used for school gardens and outdoor teaching. They should be paved with hard, dry and even surfaces, with slight falls to avoid central gullies; the paving materials suggested are tarmac, asphalt or concrete, which are clean and dry quickly, and also are satisfactory surfaces for marking games courts. Any surface liable to become dirty or dusty should be avoided.

Proper provision should be made for drinking water near playgrounds, fountains should be fixed at heights between 28in. to 30in.

### Area of Playground

The Regulations specify the areas of playgrounds, which are tabulated in the adjoining column.

INITIAL FIVE-YEARS COURSE/MIXED SCHOOLS

| Size of school | No. of pupils | Playground area | Site (including paved area) | | Playing-field* | Total |
|---|---|---|---|---|---|---|
| | | sq. ft. | acres | sq. ft. | acres | acres |
| 1 F.E. | 150 | 16,000 | 1½ | (19,900) | 4½ | 6 |
| 2 F.E. | 300 | | 2 | (19,900) | 7 | 9 |
| 3 F.E. | 450 | 32,000 | 3 | (34,200) | 10 | 13 |
| 4 F.E. | 600 | | 3¾ | (34,200) | 10 | 13¾ |
| 5 F.E. | 750 | not specified in the Regulations | 4½ | (51,200) | 13 | 17½ |
| 6 F.E. | 900 | | 5¼ | | 13 | 18¼ |
| 7 F.E. | 1,050 | | 6 | | 16 | 22 |
| 8 F.E. | 1,200 | | 6¾ | (68,200) | 16 | 22¾ |
| 9 F.E. | 1,350 | | 7½ | | 19 | 26½ |
| 10 F.E. | 1,500 | | 8¼ | | 19 | 27¼ |

INITIAL FIVE-YEARS COURSE/BOYS' SCHOOLS

| Size of school | No. of pupils | Playground area | Site (including paved area) | | Playing-field* | Total |
|---|---|---|---|---|---|---|
| | | sq. ft. | acres | sq. ft. | acres | acres |
| 1 F.E. | 150 | 16,000 | 1½ | (10,400) | 4½ | 6 |
| 2 F.E. | 300 | | 2 | (19,900) | 7½ | 9½ |
| 3 F.E. | 450 | 32,000 | 3 | (34,200) | 9 | 12 |
| 4 F.E. | 600 | | 3¾ | (34,200) | 10½ | 14¼ |
| 5 F.E. | 750 | not specified in the Regulations | 4½ | (51,200) | 12 | 16½ |
| 6 F.E. | 900 | | 5¼ | | 13½ | 18¾ |
| 7 F.E. | 1,050 | | 6 | | 15 | 21 |
| 8 F.E. | 1,200 | | 6¾ | (68,200) | 16½ | 23¼ |
| 9 F.E. | 1,350 | | 7½ | | 18 | 25½ |
| 10 F.E. | 1,500 | | 8¼ | | 19½ | 27¾ |

INITIAL FIVE-YEARS COURSE/GIRLS' SCHOOLS

| Size of school | No. of pupils | Playground area | Site (including paved area) | | Playing-field* | Total |
|---|---|---|---|---|---|---|
| | | sq. ft. | acres | sq. ft. | acres | acres |
| 1 F.E. | 150 | 16,000 | 1½ | (10,400) | 4 | 5½ |
| 2 F.E. | 300 | | 2 | (19,900) | 6½ | 8½ |
| 3 F.E. | 450 | 32,000 | 3 | (34,200) | 8½ | 11½ |
| 4 F.E. | 600 | | 3¾ | (34,200) | 9½ | 13¼ |
| 5 F.E. | 750 | not specified in the Regulations | 4½ | (51,200) | 10½ | 15 |
| 6 F.E. | 900 | | 5¼ | | 11½ | 16¾ |
| 7 F.E. | 1,050 | | 6 | | 12½ | 18½ |
| 8 F.E. | 1,200 | | 6¾ | (68,200) | 13½ | 20¼ |
| 9 F.E. | 1,350 | | 7½ | | 14½ | 22 |
| 10 F.E. | 1,500 | | 8¼ | | 15½ | 23¾ |

* Where not exceeding one half of these areas is provided with a hard porous surface for games, such areas may be counted as three times their actual area.

ADDITIONAL AREAS REQUIRED FOR COURSES LONGER THAN FIVE YEARS

| No. of pupils in sixth, seventh, or eighth year of their course | Add to the areas specified in the above Tables: Site | Playing-field | Total |
|---|---|---|---|
| | acres | acres | acres |
| 1–60 | ¼ | 1¼ | 1½ |
| 61–120 | ½ | 1¼ | 1¾ |
| 121–180 | ¾ | 2½ | 3¼ |
| 181–240 | 1 | 2½ | 3½ |
| 241–300 | 1¼ | 3¾ | 5 |

SECONDARY SCHOOLS: PLAYING FIELDS, SPORTS PAVILIONS, SWIMMING BATHS

### Playing Fields

Reference should be made to the paragraph on playing fields in the section on primary schools and also to Part 1: Recreation, where the sizes for various games are given, but it should be noted that some spaces of indefinite sizes are needed for practice pitches, long jumps, etc., which can be placed on odd spaces of suitable sizes in playing fields. Additional spaces and pitches are needed to rest the ground and maintain it in a playable condition. Care should be taken to avoid close proximity to trees. Sites which are reasonably level should be sought to avoid excessive cost in preparation.

The information on the planning requirements of various games given in Part 1: Recreation is for general purposes; for school purposes these may frequently be reduced with advantage.

### Facilities for Changing

This problem is greatly simplified if the playing fields adjoin the school, when advantage may be taken of the normal cloakrooms and lavatories or gymnasium changing rooms; but it is desirable to extend the normal accommodation somewhat and to add shower baths, foot baths, and, if possible, a small plunge bath. The same changing rooms might be used for games and a swimming bath, if both are situated near enough together. If, however, playing fields are provided centrally for a number of schools, or if they are far from the school itself, changing rooms or sports pavilions must be provided in connection with the playing fields. (*See also* under "Gymnasium" later in this section.)

### Sports Pavilions

These vary considerably in size and character according to the type of school and whether near or far from the school buildings. They used to be, in fact, no more than changing rooms, together with the necessary lavatory and W.C. accommodation, and with apparatus stores. For secondary schools more elaborate buildings are frequently required, including refreshment facilities for one or two visiting teams and a similar number of house teams. Opinions vary in regard to the number of changing rooms which should be provided. A frequent provision is a large room for junior pupils, one or more smaller rooms for senior pupils, and a room for visiting teams. Each room should have at least shower baths and lavatory basins, with hot and cold water, and preferably some ordinary baths or a plunge bath in addition. Reference should be made to the section on "Sports Pavilions," but bearing in mind always that the needs of schools are more simple than of pavilions used for other purposes. The changing rooms can be very simply fitted up; wooden seats round the walls and island seat-fittings, if the rooms are sufficiently large, with clothes hooks above and shoe racks under the seats are the chief needs. Lockers are generally unnecessary. Ample ventilation and light are very important, as also are floor materials; the latter should be such that they are easy to clean and do not suffer damage from studded boots, mud or wet feet.

The refreshment facilities, when required, usually consist of a large room to seat the necessary number of persons at one time, based on an allowance of 8sq. ft. to 9sq. ft. per person, together with a small combined kitchen and service room; little actual cooking is required, as meals are generally ready cooked or necessitate only the boiling of water for tea; good and plentiful china and glass storage is important, with ample draining-board space near the sink. The chief need, otherwise, is table space on which meals may be prepared.

### Games Store

Adequate and properly fitted up storage is needed for games equipment either at the school or at the playing fields. The amount and type of accommodation needed will vary greatly from school to school, according to the amount of interest given to organized games. Fig. 52 on page 243 gives details of the way in which suitable racks may be provided to meet the needs of different games. Cricket bats require a shelf with raised edge about 5in. wide, with a similar shelf fixed at 2ft. 3in. above it and perforated with holes at 4in. centres which should be 3in. diameter for bats and 2in. diameter for stumps. Cricket, hockey and similar balls can either be kept in cupboards or on racks; it is advantageous if the balls are raised off the shelves to permit of adequate air circulation by resting them on three-pointed supports. Footballs and netballs can be stored on shelves about 11in. wide with a high front edge; holes 2in. diameter and 10in. centres should be made in these shelves. Sticks for rounders may be held in wall clips spaced at 6in. centres. Hockey sticks require 3in. diameter holes spaced 4in. apart in a rack placed above a sloping base as shown in Fig. 52, a shelf 1ft. 2in. will accommodate three rows of sticks. Tennis rackets require a shelf about 13in. wide with 2in. diameter holes placed at 3in. centres.

All these shelves and fittings must be strongly made and very securely fixed to the walls. Cupboards are also needed for the storage of cricket pads, gloves, score books and various similar smaller articles.

### Swimming Baths

Except in some secondary schools and in a few voluntary schools, swimming baths for the exclusive use of a school are not provided. It is usual to arrange for attendance of classes at public baths or to have a bath to serve a group of schools in an area. It is desirable when swimming baths are provided, that they should be of the covered type, as the building may be used for certain other physical activities in the winter months if the bath is covered by a temporary floor. Swimming baths, both open-air and covered types, are fully discussed in the two sections devoted to these subjects.

## SECONDARY SCHOOLS: SPACE REQUIREMENTS, RELATIONSHIP OF ROOMS, ENTRANCES, CLOAKROOMS

### Space Requirements

Secondary schools can be divided into seven parts for the purpose of analysis: general classes, practical classes, library, dining, assembly, gymnasium and administration.

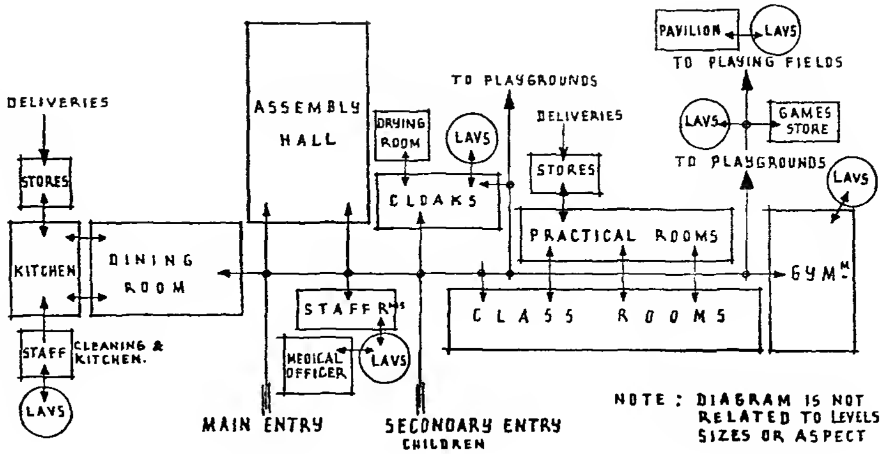



Fig. 20 Typical plan analysis

### Teaching Accommodation

The Regulations set down the area of teaching accommodation required in each size of school, where there are both boys and girls, as:

| | |
|---|---|
| One form entry .. | .. 8,660sq. ft. |
| Two form entry .. | . 14,180sq. ft. |
| Three form entry | .. 20,680sq. ft. |
| Four form entry | .. 26,680sq. ft. |
| Five form entry .. | .. 32,680sq. ft. |
| Six form entry .. | .. 37,680sq. ft. |

In the case of schools for a single sex only, the one and three form entry schools should be reduced in area by 850sq. ft. each.

Any classroom for 30 pupils shall be not less than 480sq. ft. and each school or department shall include an art and craft room, gymnasium, hall, library, practical rooms and science laboratory, except in one form entry schools or departments where the gymnasium and hall may be combined.

### Relationship of Rooms

As in primary schools the communal rooms and library form the core of the school, while the practical and general teaching rooms often form two further divisions; some allowance should be made, however, for general teaching rooms near the practical rooms.

### Entrance Space

The conditions for entrance spaces given in the section on primary schools apply equally to secondary schools.

Entrances must not lead directly into an assembly hall or into any teaching room, nor should they be used as cloakrooms. In large schools more than one entrance may be needed, and several exits are essential. Service entrances for deliveries should be quite separate from those giving access to the school proper. External doors of entrances should open outwards, and external steps must have ample landings between the doors and the top step. Outside steps should be protected to prevent slipperiness in frosty weather. An outside artificial light point is essential. Doors should be at least 4ft. 6in. wide, in two leaves, and are better if the upper part is glazed, unless there is a lobby with internal glazed doors, and the outer doors are kept open during normal school hours.

A mat-sinking of a large size is desirable. Facilities for anchoring the doors open are needed. School halls are frequently let for meetings, etc., after school hours, and therefore corridor approaches and exits must conform to established regulations for places of public entertainment. The main school entrance should give access to the head teacher's room or rooms, in the case of mixed schools, and, unless the assembly hall is placed away from the head teacher's room, this entrance can well serve as the main public entrance to the hall; it is generally desirable that the head teacher's room should be near the hall, and the main entrance is, conveniently, of dual purpose.

The main entrance to the school should not be cramped in area if it is used in conjunction with the hall for either school functions or for public lettings of the school's assembly hall. Care should be taken that doors opening outwards do not obstruct footpaths or playgrounds; they should therefore be set in recesses or in projecting porches.

### Cloakrooms

Cloakroom requirements vary with each type of school, although there are many factors which are constant. There are various positions in which cloakrooms may be placed in relation to the entrance and the classrooms. The more general method adopted is to plan large cloakrooms near the entrances of each department. There are, however, indications pointing to the adoption of alternative methods, namely, planning small cloakrooms to serve two classrooms only, between pairs of classrooms, as shown on Fig. 21, Diagram B, or even single class cloakrooms attached to each classroom; the last is specially suitable for primary schools. If the first method, Diagram A, is adopted, the cloakrooms must adjoin entrances and be accessible from corridors or lobbies and also be quite separate from all rooms used for teaching purposes. It is desirable that there should be separate doors or gates for ingress and egress to avoid confusion and crowding; ample space should be allowed in the corridors adjoining cloakroom entrances; if the cloakrooms are large, several doors may be required. Through ventilation and good light are essential. Windows should be placed at the ends of gangways between clothes racks and not so that one row of fittings shields the light from the next. The main objection to the arrangement shown in Diagram A is that the concentration of large numbers of children at one or

two places tends to cause congestion, excessive noise and waste of time. There is no doubt that experiments in cloakroom arrangements attached to locker rooms and classrooms are still needed to overcome the disadvantages of the present systems. The second method, illustrated in Diagram B, is rather more costly, but avoids crowding into one large room, separates the classes for easier supervision and permits some rooms to be closed if part of the school only is in use as, for instance, for evening classes. Careful planning of cloakrooms and lavatories is needed in those schools used for evening or other social activities to avoid opening up the whole of the school during these periods. Doors or gates which can be locked are frequently required; it is generally undesirable that cloakrooms should be used as " cut-offs " or lobbies to lavatories.

Adequate means of heating to dry damp clothes are needed in cloakrooms, but care should be taken in the placing of heaters to avoid damage to clothing and especially to boots. Heating of the clothes rails themselves should be avoided. Heaters should be controlled at comparatively low temperatures. The drying of wet clothing will be discussed later in this section. Floors should be of impervious materials such as asphalt, granolithic or tiles, and walls should have a smooth, hard surface to facilitate cleaning and washing down; the impervious wall finish must be at least 6ft. high in all cloakrooms. Cloakrooms attached to classrooms will also be discussed in conjunction with the placing of lavatories later in this section, together with details of planning and equipment.

A type of cloakroom which seems to be widely used in other countries but not to any degree here, is formed by widening the corridors near main entrances or at other convenient points for groups or single classes, as illustrated in Fig. 22. The main objection, specially applicable to this country, to cloakrooms in this position, is the difficulty of preventing the smell of damp clothing from penetrating the whole school and very special and even costly mechanical ventilation may be necessary.

Fig. 22 shows two types of corridor cloakroom arrangements. The corridor must still be the 6ft. minimum width, and the projection or additional width of the cloak space is dependent on the numbers to be accommodated. By the use of shallow recesses this method may be used to provide a continuous coat stand sufficient only for each classroom.

All cloakroom fittings should be of types giving through ventilation and easy cleaning. The spacing and types of fitting vary only slightly with the type of school. Fittings may be of wood or of metal, but the latter material is now more generally used in the form of tubing and strong wire mesh; the seats over shoe lockers are, however, generally of wood. All fittings, except for a minimum number of supports, should be kept clear of the floor, to permit the latter to be washed easily. All hooks should be numbered for ease of allotment to pupils. Shoe or boot cages with seat tops are essential as an encouragement to the changing of shoes during school hours, more particularly for younger children and those coming from longer distances, as wet feet are the cause of many ailments.

Pegs are more generally supplied for hats, but racks or, even better, open-sided cages are more satisfactory and more hygienic in order to prevent clothes touching one another. Hooks are usually provided for coats, but coat hangers are to be preferred, as they ensure better separation of damp clothes and clothes are less damaged when hung on shaped hangers. It appears, however, more difficult to plan for the use of hangers when economy of floor space is a major consideration.

Gangways should be at least 5ft. wide between the clothes stands or between walls and stands. Hat-and-coat hooks should be provided in not more than two tiers, with the hooks in each row staggered, but no length is saved by this double row arrangement, as the horizontal distance between two

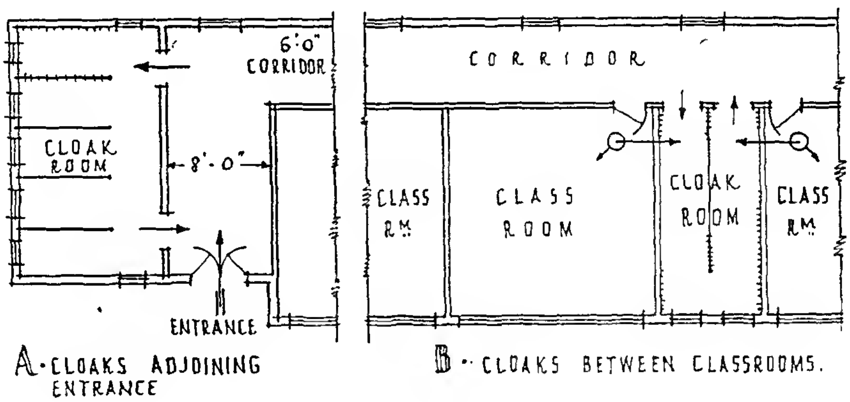



Fig. 21 Typical cloakroom planning

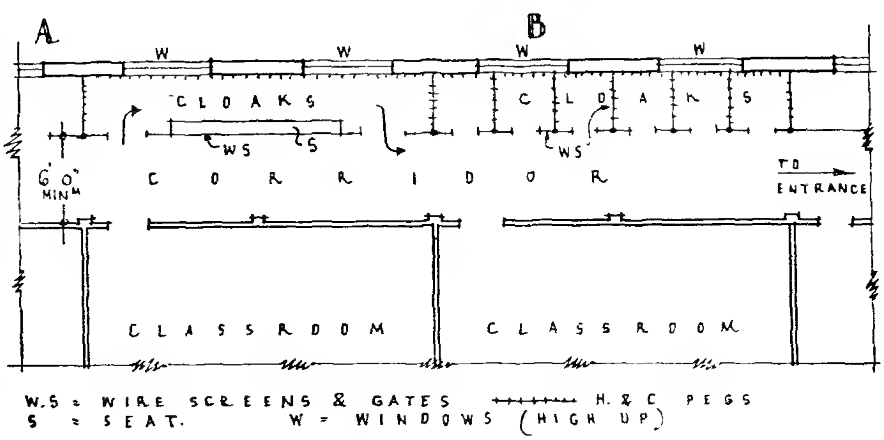



Fig. 22 Corridor cloakroom planning

adjoining pegs must be at least 10in. for boys and 12in. for girls; the only advantage is that provision is made for varying heights of children.

Fig. 23 shows two typical cloak-room fittings, together with the main dimensions desirable for the different types of school. For secondary schools a hook height of 5ft. 6in. is needed and for primary schools 4ft.; if a second and lower level is provided it should be not more than 12in. below the higher rail. Infants' departments need a rail height of 3ft. A centre support fixed to the floor and the ceiling, similar to that shown in Type A, is often used instead of the double support with only floor fixing shown in Type B and wire mesh is sometimes fixed between the supports to separate the clothes, but there seems little in favour of this arrangement, as it is difficult to clean. Shoe cages generally follow the same spacing as the hat and coat hooks, namely, 10in. for boys and 12in. for girls and their height should be at least 6in., increasing to 8in. for older children; there should be a minimum clearance of 6in. under the shoe cages for easy cleaning of the floor. In some schemes the seats with the cages attached are hinged to the main supports so that they can be lifted to assist cleaning. Seat heights should be 12in. for infants, 13in. for other primary pupils, and 16in. for secondary schools. Seats should be at least 10in. wide and preferably 11in. or 12in. for senior boys in secondary schools, to permit of deeper cages for larger-sized shoes. Diagram A is based on the use of coat hangers, and as the coats would cover too much of the seat it is necessary to leave a space of 1ft. 6in. between the seats; the scheme shown has the hangers placed 5in. apart for boys and 6in. for girls, as clothes on hangers need less space to avoid contact with those adjoining. If a double-sided hat rack is provided instead of hat pegs, each child still has the full width of 10in. or 12in. The main objection to the use of hangers is that this requires an overall width of 3ft. 2in. compared with 1ft. 10in. necessary for the type shown in Diagram B. When hat pegs are used it is general to provide a much greater projection for the use of girls than for boys.

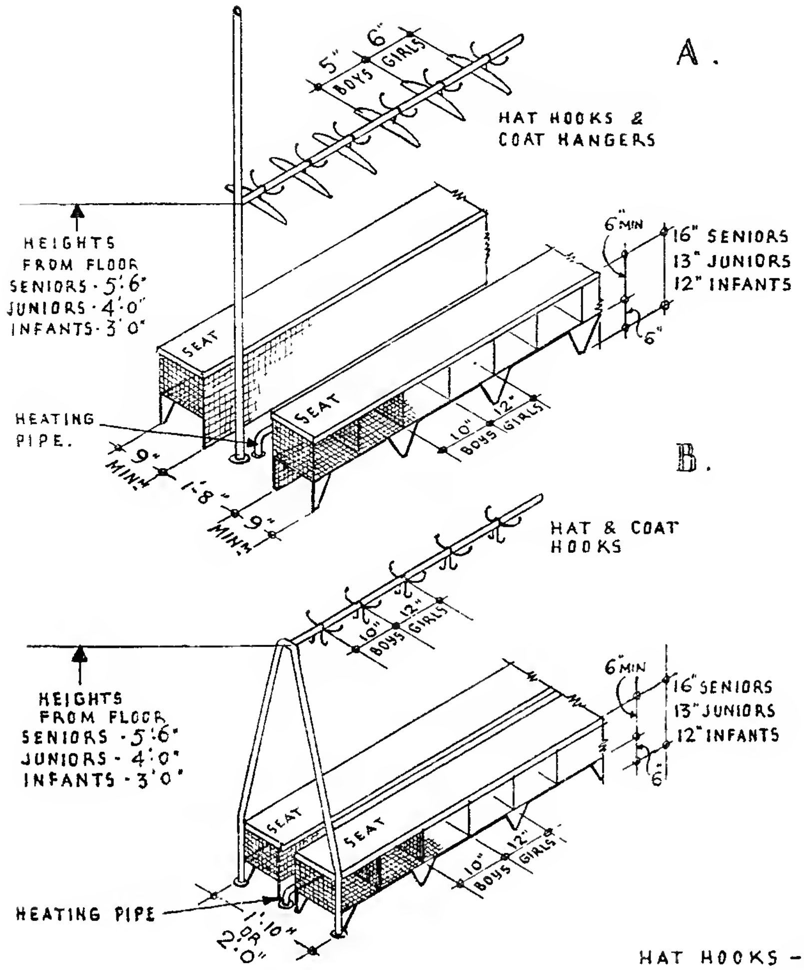
Individual clothes lockers are seldom used in school cloakrooms, except for technical schools and for evening classes; individual lockers for clothing involve a high initial cost, but they have the advantage of providing storage for both clothes and books so that special book lockers may be eliminated. Clothes lockers are generally of metal and should be adequately ventilated. Cloakrooms attached to classrooms as those suggested in Fig. 21, Diagram B, need a width of not more than 9ft. Collapsible gates or wire-panelled doors allow ventilation to the corridor and proper cross-ventilation. It is suggested that book lockers may be placed in the centre of the cloakroom compartments.

### Drying Rooms

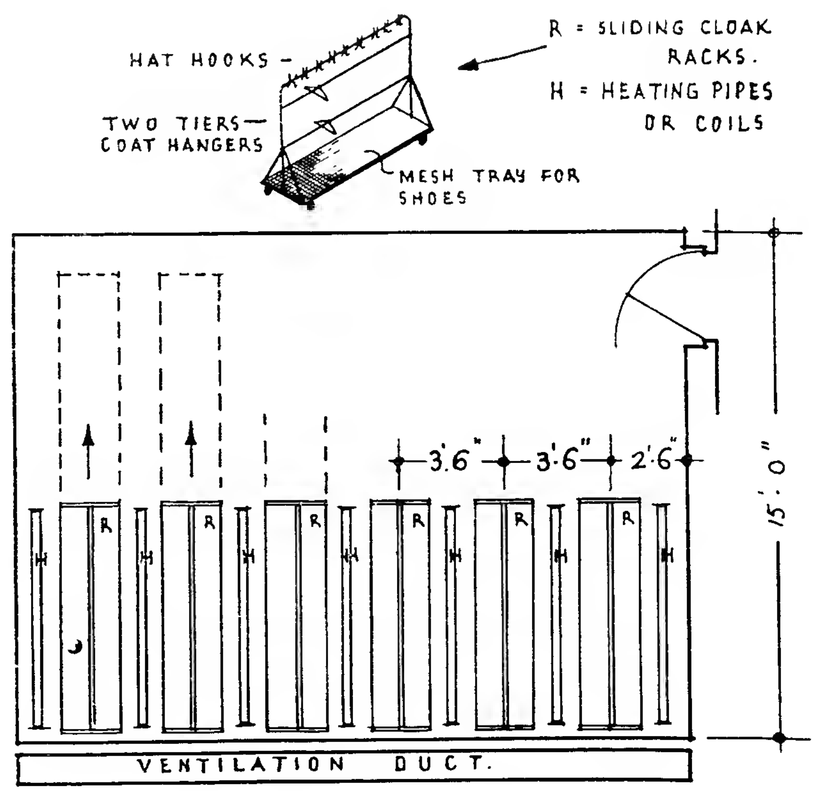
Drying rooms in which wet clothing may be dried are essential in all schools. The amount of space needed is likely to vary considerably according to the locality of the school, but it is unlikely that provision ever needs to be made for more than about 60 per cent of the children. Drying rooms present some problems, as the time available for drying clothes may be limited to about three hours; as, however, children from long distances are probably those who remain for lunch, a longer period is usually available. Excessive temperature should be avoided as it is detrimental to clothing. Any efficient system will need a considerable amount of heat and almost certainly mechanical ventilation. Since the drying room may be needed in summer-time when school heating, other than that for domestic hot water, is not in use, it is better to rely on methods giving intermittent facilities; gas and electricity, when fuel costs permit, should be considered.

Various systems of handling wet clothing have been tried in schools and factories; many depend, basically, on movable "horses" or similar devices, from which the clothing is suspended. Fig. 24 illustrates a typical layout, using movable "horses" arranged between heating units; coat hangers are fixed to the "horses," in one or two tiers, according to the ages of the children. A simpler arrangement is to provide fixed rails on which fixed coat hangers are spaced about 6in. apart, under which are placed heating coils or rails; these coat rails may be about 5ft. apart giving 3ft. 4in. for gangways and 1ft. 8in. for the clothes racks; end gangways should be about 5ft. wide. It is also desirable to have a number of projecting pegs fixed on the walls on which boots may be suspended upside-down.

The drying room should adjoin or be entered from the general cloakroom, to avoid unnecessary movement of clothing about the building.




Left: Fig. 23 Two typical fittings for school cloakrooms: sizes suitable for children of various ages are given




Right: Fig. 24 Typical drying room—dimensions and fittings

**Lavatories**

The Building Regulations stress the necessity of providing adequate lavatory accommodation; over a period of years there has been a gradual raising of the standard of accommodation, and emphasis is increasingly laid on the need to instil ideas of personal hygiene at the earliest age and to continue this training throughout the whole school period. The requirements of the 1945 Regulations have been found too generous and a revision of these requirements has been made. One somewhat controversial matter is involved which affects very closely the planning of lavatories, namely, the method of providing towels. The Regulations stress the need for a " generous supply of towels " with " adequate space for hanging, storing and drying towels," and continues by " advocating an individual towel for each child and separate pegs on which it can be hung." There is a further suggestion that towels should not " hang flush with the wall," which would appear to indicate a disapproval of roller towels such as are now generally used. To provide pegs for individual towels in such a manner that they do not touch would appear to need a room having a floor area many times greater than has previously been contemplated as each towel requires some 9in. of wall or rack space; such an ideal provision, though usual in nursery schools, seems unlikely to be immediately achieved in all secondary schools.

Lavatories may be attached to cloakrooms and W.C.s: if grouped with the former they should be in such positions that the cloakroom can be closed and used separately, if desired. The location is much influenced by the manner of providing towels; towels may be provided by the children themselves in which case storage is needed either in the lavatory or in a cloakroom adjoining or towels may be provided by the school in one of several ways; firstly, a clean towel may be provided for each occasion one is used and then discarded for washing, which is an excellent arrangement if facilities can be provided for washing towels either in the school or for a group of schools; secondly, a towel is provided for each child and then storage is again required; or thirdly, communal towels such as roller towels are provided and changed at frequent intervals. The last arrangement involves much less space, necessitates more work for the caretakers, and is less hygienic.

Hot- and cold-water supplies are essential wherever the supply of water permits. Some schools are now provided with controlled-temperature warm water and only one tap for each basin, as a means of economy; but it is bad training for pupils who have separate hot and cold services in their homes. Good light and ample ventilation are essential. Basins or, if washing-troughs are used, an equivalent length and number of taps, should be provided at the rate of four basins for the first 30 pupils, with one additional basin for each additional 15 pupils up to 300 and then one additional basin for each additional 30 pupils. Basins should be 22in. long and 18in. from back to front, and fixed at the normal adult height of 32in. Floors should be of impervious materials, such as asphalt tiles, ceramic tiles or granolithic, laid to fall to floor channels or gullies for easy cleaning. Similar materials should be used for wall facing to a height of at least 6ft.

The following number of W.C.s is needed; four fittings for the first 30 pupils, with one additional fitting for each additional 15 pupils up to 300, and one extra fitting for each 30 pupils thereafter. At least one-third of the fittings for boys must be W.C.s.

Urinals should be of the stall type and if slab types are used divisions should be provided; each stall or division should be served by automatic flushing apparatus. Stalls should be planned on a basis of 21in. run per person and should be 3ft. 6in. high. Adequate entrances and exits to the urinal apartment are essential to avoid congestion. Urinals should be in an enclosure separated from the W.C.s, although this may prove to be difficult to plan in some instances. Floors should be finished with materials such as hard asphalt or tiles and should be laid to fall to the urinal channel for easy washing down.

Pads have been widely used instead of seats but it is considered better training and more hygienic if seats are provided as should be found in the homes of the children; plastic seats with flat undersides are hygienic and more easily cleaned. Each W.C. must have its own flushing apparatus but this is best met by the provision of trough-type flushing-cisterns which avoid the refilling time lag involved by the use of separate flushing-cisterns. W.C. partitions must be 2ft. 6in. wide in the clear, 6in. clear of the floors and should be 6ft. 6in. high above the floor; doors should be 6in. clear of the floor and 6in. short of the framing at the top. Partitions in tubular metal framing with metal-faced partitions are light and easy to keep clean. If partitions are not carried up to within a short distance of the ceiling, the space between the framing and the roof or ceiling should be unclimbable. Doors for all older children require fastenings and are best hung on " falling " butts so that they remain open when not in use. Thought should be given to protection of plumbing in frosty weather and it is an advantage to form a heated passage or duct behind the fittings in which all plumbing and drainage is placed: this has the added advantage that all plumbing except the " pull " is out of reach of the children and is easily accessible.

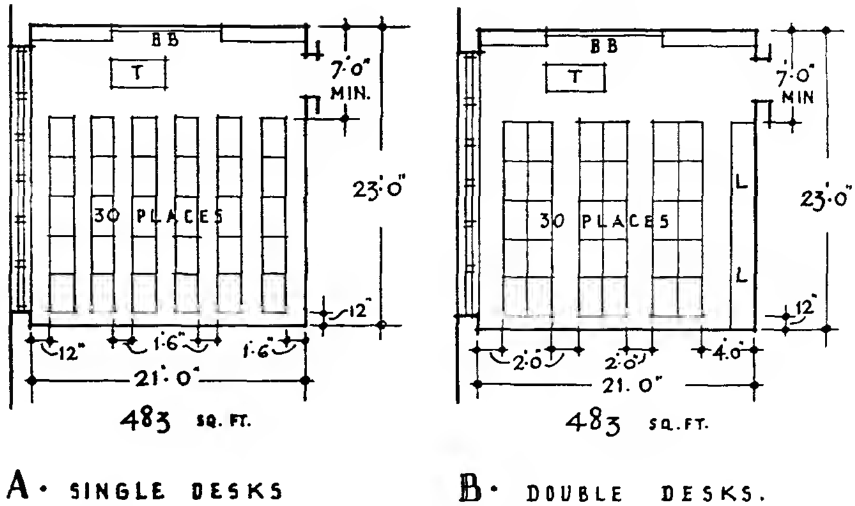
**Staff Lavatories**

The head teacher, and possibly the head of each department, if they are of opposite sexes, may need a private cloakroom, lavatory and W.C. near his or her room but not communicating directly with it. The remainder of the teaching staff should have separate accommodation for each sex; it should comprise a cloakroom, preferably with lockers, a lavatory and W.C.s; these rooms should not communicate directly with staff common rooms but should be planned near them. W.C.s should have full height partitions. The number of fittings is not specified but the following is a guide:—

| *Staff* | *Basins* | *Closets* |
|---|---|---|
| 3–6 | 2 | 1 |
| 6–9 | 2 | 2 |
| 10–20 | 3 | 2 |
| 20–35 | 4 | 3 |

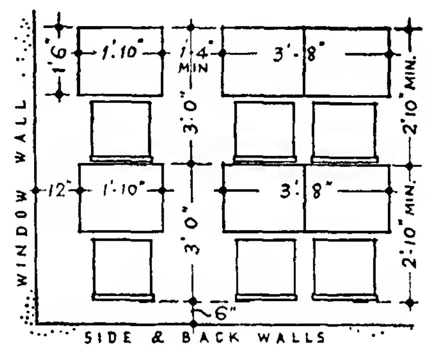
**Visitors' Lavatories**

Lavatory provision should be made for visitors of both sexes in all schools. When the building is likely to be used for purposes other than the normal school routine it is essential that cloakrooms and sanitary accommodation for both sexes should be available in adequate proportions, and in positions convenient for the expected use.




Above: Fig. 25 Two typical layouts of classrooms

KEY
W—window
T—teacher's table
BB—blackboard
L—lockers




Right: Fig. 26 Spacing of desks and tables

### Classrooms

The Ministry of Education's Regulations set out clearly the floor areas for all types of classroom, but the subsequent Bulletins have left greater discretion to designers. Classrooms should not be passage rooms from one part of the building to another nor must they accommodate more than one class.

The Regulations require a minimum floor area for classrooms of 480sq. ft. on the basis of accommodating 30 pupils; some classrooms for special subjects must, however, be 720–900sq. ft.

Fig. 25 illustrates two typical classroom layouts based on the furniture dimensions shown in Fig. 26. Diagram A is based on the use of single tables and chairs or single desks, and Diagram B on dual desks or tables. Since both diagrams show rooms of the same dimensions, it should be noted that Type A can only just be accommodated in the 480sq. ft. area and no space is available for lockers on the side wall, if these are required, as shown in Type B. If, however, the gangways shown in Type A between the desks are reduced to a dimension below that desirable (to 1ft. 4in. or 1ft. 5in.), the width of the room may be reduced to 20ft. and the length may be increased to 24ft. which allows the desirable 8ft. space at the blackboard end of the room. A similar reduction of gangway width (to about 1ft. 6in.) in Type B permits a similar teacher's space; such a reduced width may be advantageous and provide better lighting. Single tables or desks are definitely to be preferred for all pupils and are really essential for all older pupils, especially if they remain to the age of 17 or 18 years; in such schools, where pupils stay to the sixth form stage, " division study rooms " for small groups of pupils are desirable; these should be based on accommodation for 15 to 20 pupils; each should have an area of at least 16sq. ft. per pupil.

### Practical Rooms

This group of rooms covers a wide range of rooms for the teaching of special subjects, the requirements of which vary very considerably. Much more emphasis has been placed on the provision of these special purpose rooms in recent years and due to the extension of the school age the need will be still greater in the secondary schools of the future.

The best shape for these rooms is likely to approximate to a square, with the lighting on the longer wall. The rooms should have good lighting, but need not necessarily have a south-east or south aspect. The equipment should consist of movable tables and chairs, as the rooms are used for general art and craft purposes. It is desirable that two or three sinks, gas points, electric power and light plugs be provided in each room. A fixed bench along the window wall is also useful. Large store-rooms should adjoin general purpose rooms (with direct access from them if possible) in which may be placed the work in progress of each class, equipment, new materials, models, etc.

For secondary schools the Regulations give indications of desirable areas for practical rooms.

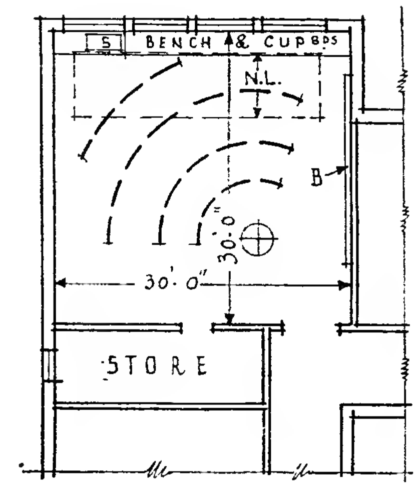
The more usual subjects for which special rooms are provided cover art, crafts, handicraft, science, housecraft, wood and metal workshops, geography, book-keeping and typewriting; in some more specialized schools other subjects have to be provided for, especially for older pupils in schools giving technical courses. It will be noted that grammar schools require fewer specialized rooms for some subjects, such as housecraft, but more accommodation for subjects such as science; whereas modern and technical schools each require different distributions of the practical-room space.

## SECONDARY SCHOOLS: ART AND CRAFT ROOMS, GEOGRAPHY ROOMS

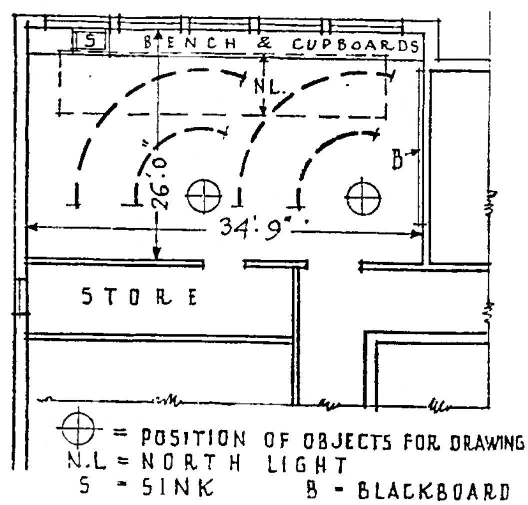
### Art and Craft Rooms

For art and craft rooms an area of at least 900sq. ft. is required in all secondary schools, and to this are frequently added one or two eraft rooms of 960sq. ft. each for general courses for pupils up to 16 years. Areas of 960sq.ft., planned with a sliding or folding partition, are useful as forming two " form bases " each of 480sq. ft. The subjects covered in the craft rooms are very varied and may include bookcraft, printing, weaving, fabric printing, model making and pottery. If several craft rooms are provided they should be grouped together and, where possible, grouped with other practical rooms; in larger schools one room is likely to be devoted mainly to drawing and becomes an art room proper, leaving the others mainly for crafts. The lighting of art rooms is of special importance and the light of a north aspect is desirable, but it is often considered to be of less importance for craft rooms, where light from sunny aspects is advantageous; the provision of north light dictates to some extent the position of the rooms in any plan. Proper lighting in art rooms is essential to procure effects of light and shade on objects to be drawn; cross or confused lighting with windows on several walls should be avoided, except for small high-level windows, introduced for purposes of cross-ventilation. Art rooms are often approximately square in shape as shown in Fig. 27A, but longer and narrower rooms as shown in Fig. 27B, although disliked by some authorities, have the advantage that two or more separate groups can work round different subjects at the same time. Craft rooms are better if shaped as shown in Fig. 27B. Widths of 24ft. or more require ceiling heights over 11ft. to provide adequate side lighting, unless top lights are provided in addition.

Right and below: Fig. 27 Typical layout diagrams for art rooms




A




B

In the square type of room, one large window with bars, mullions, etc., reduced to the minimum required for structural safety, is the most satisfactory, or if several windows are used they should be grouped close together. The windows should extend to the ceiling and even have some top north light and should have a sill level of 5ft. or 6ft. above the floor; windows should be fitted with blinds drawing up from the bottom, or curtains, so that the light may be easily adjusted. It is also necessary in craft rooms that the windows can be darkened when a lantern or an epidiascope is used. A large demonstration blackboard, preferably of a material into which drawing pins may be fixed, should be placed on the wall opposite the pupils when seated, with the main light on their left hand; wall space should not be broken up more than is necessary in order to provide maximum space for displaying objects, pictures and drawings. One or two sinks with water laid on and draining boards are needed in a convenient position; these sinks may be placed in a bench fitted under the window. Sinks are also planned in storerooms in some schemes, but in such a position there is a greater risk of damage by splashing and supervision is more difficult. Wall benches should have drawers and cupboard space below, and the widths should be based on the storage of drawings, and drawing paper of the sizes likely to be used in the room. Racks for water pots should be provided, and if clay modelling is to be part of the training a portion of the floor should be tiled; sometimes a separate room is provided for modelling in clay and for pottery work. This is specially convenient when a kiln is installed. If a separate modelling room is provided the floor should be tiled or finished with other impervious materials. Floors of art and craft rooms are best of wood which is less damaged and damaging if tools are dropped.

Furniture should consist of light trestles and chairs or box stools for drawing; table tops to be laid on the trestles for craft or other work should be provided. Alternatively, single flat-topped tables about 24in. by 18in. may be used and can be made adaptable for both art and craft work, especially if covered with linoleum or hardboard,

which are easily renewable. Loose blocks of wood are used for tilting drawing boards on flat-topped tables. One or two strong tables, about 6ft. by 3ft., should be provided. A glass-fronted store and display fitting containing drawers for imperial-sized paper and other materials is required. The top of this fitting and that of window benches should be available for craft work and heights should, therefore, be suitable. A strip of wood 2in. or 3in. wide, fixed flush with the wall plaster, about 18in. or 2ft. above the dado, is useful for pinning up drawings and also a continuous narrow shelf 6in. wide with a raised edge placed 3ft. above floor level.

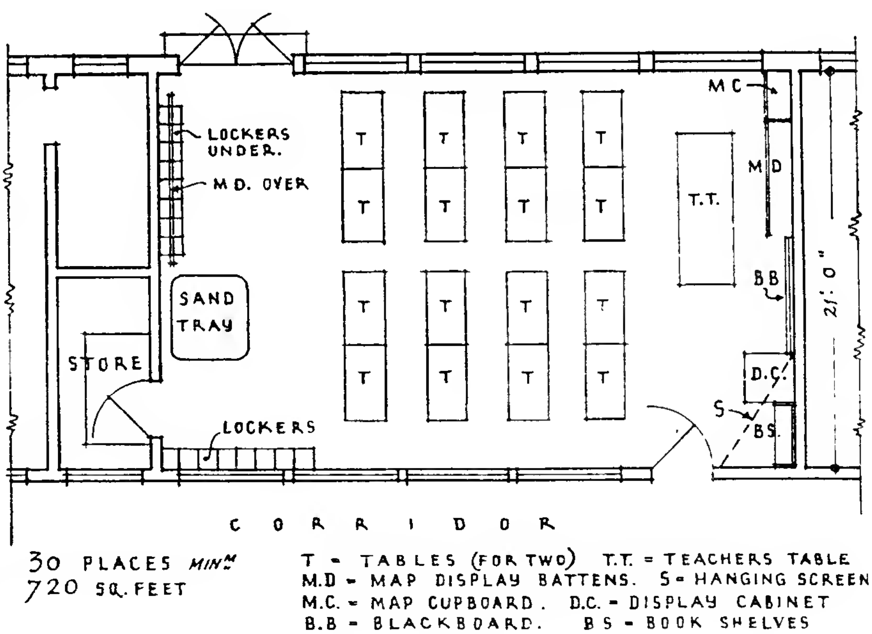
A store-room should be attached and have direct communication with the art room. It should be about 150sq. ft. in area and be fitted with shelves for the storage of casts, some of which may be at least 18in. wide. Shelves must be strongly constructed as the weights to be carried may be heavy. Other equipment is needed for the storage of drawing boards in vertical racks, and cupboards for general storage of small objects. Special consideration must be given to the artificial lighting of art rooms, and the most satisfactory general arrangement seems to be by means of one powerful lamp placed in such a position as to bring the source of light as nearly to the position of that provided by the windows in daytime. An alternative method is to provide small shaded local lights over the drawing boards, with a powerful movable and adjustable lamp which can be directed on the object to be drawn. Good overall general lighting is required for the rooms to be used for craft purposes.

### Geography Room

In primary schools a separate room is seldom provided for geography, but one of the general-purpose rooms may be used partly for teaching this subject. In secondary schools, a special room is frequently required, with an area of 720sq. ft., although it is sometimes used also for teaching other subjects, and it is better to use areas of 960sq. ft. The room should be on the ground floor and have a south or south-east aspect; direct access to the open air is also useful so that meteorological instruments placed outside may be easily accessible. Provision should be made for use of a lantern by the proper installation of blinds, electric power point and screen. A convenient size for the demonstration bench is 8ft. by 3ft. Flat tables and chairs should be used, and not desks; it is usual to provide dual tables about 4ft. by 2ft. Water supply and a sink are needed, either in the room or in the adjoining store. Plenty of wall space is needed for maps and pictures, in addition to the chalkboard; fixed battens for maps and a map cupboard at least 8ft. high should be provided at the teacher's end of the room. A display cabinet is needed with which may be combined a map-tracing table. A sand tray or table is also required, and is better if movable. There should be a store-room attached with direct access: this room should be fitted with shelving and drawers for maps, slides, and specimens. Bookshelves should be provided in the classroom for the storage of large books, such as atlases and reference books.

As the geography room will generally be used as a form room, lockers for pupils using the room as a form room should be provided unless corridor lockers are generally installed in the school. Fig. 28 illustrates a typical geography room. It is undesirable to use corridor borrowed lights if this can be avoided, as the wall space so lost is very valuable. The width of 21ft. shown in this figure is the minimum. For many of these special rooms a greater width is advantageous, although it is then difficult to meet daylight factor requirements.

Below: Fig. 28 Typical layout for a geography room



## SECONDARY SCHOOLS: HOUSECRAFT ROOMS

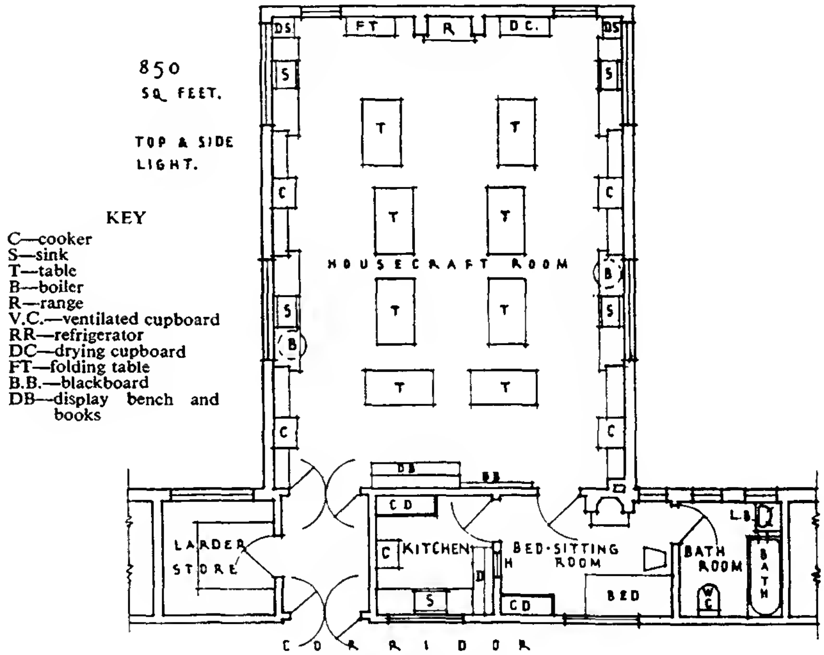
### Housecraft Rooms

The teaching of housecraft starts in the nursery school, where the children help to serve their own meals and to keep themselves and the school clean and tidy. No special provisions in regard to planning are needed at this stage. In primary schools, also, there are no special provisions in planning, although there have been suggestions that a small room might be provided in the nature of an ordinary domestic kitchen-living-room, where children feeling unwell or in need of minor repairs to clothing, etc., may go.

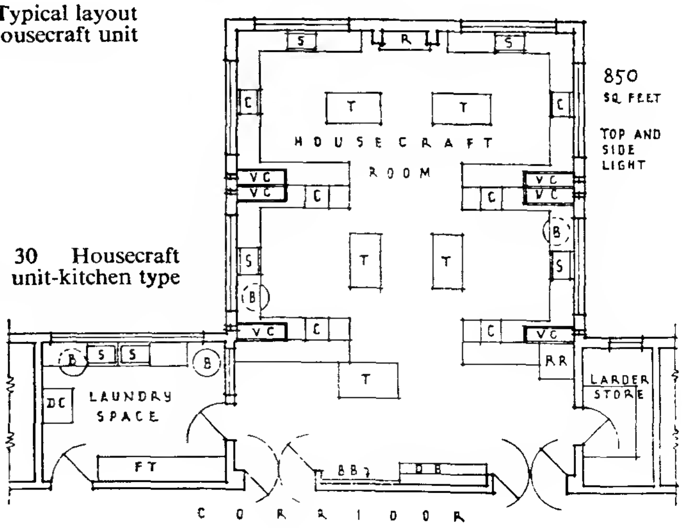
In secondary schools, however, special rooms are required for all girls' and mixed schools and the number varies only slightly according to the type of school and only in proportion to the number of pupils in each school. Housecraft rooms should be at least 850sq. ft. in area and the width should be at least 24ft., in order to accommodate equipment satisfactorily. It is usual to teach half-classes at a time with a maximum of 20 pupils, and consequently in all larger schools two housecraft rooms are needed. The accommodation must provide for the teaching of cookery, laundry and needlework; the cookery and laundry are often combined together except in more advanced technical schools, although there are some authorities who still prefer separate rooms for each of these two subjects. When two rooms only are planned for housecraft it is certainly better to combine cookery and laundry in one room and use the other for needlework: in small schools with only one housecraft room, however, the triple combination becomes inevitable. It is usual to attach to cookery and laundry rooms two or three small rooms as an annexe in the form of a flat or suite of rooms, in which home management may be taught; these rooms should be equipped and furnished in a manner similar to the homes of pupils and should represent a kitchen, bathroom and a bed-sitting room, or if space can be allowed a bedroom and a sitting-room.

Storage accommodation is of the utmost importance for the cookery rooms: ample well-ventilated space is essential and if the teaching rooms are likely to be used in the evenings as well as in the day, additional and separate storage is needed; this storage may be either a combined larder and store of about 100sq. ft., or two separate rooms of equal area. The stores should be fitted with shelving from about 3ft. above the floor upwards, and ranging in width from 9in. to 18in. and in varying heights apart from 12in. to 18in.; one shelf should be of slate or tiles. A large refrigerator is desirable, but should not be placed in the larder store.

Housecraft rooms should be planned with easy access for tradesmen's deliveries. North-aspect rooms may be used, although this is not essential, except for larders. Good ventilation is needed, particularly to prevent the penetration of cooking smells to the rest of the school. The usual school heating system is used for the rooms, but the pipes and radiators must be very carefully planned in conjunction with fixed equipment and apparatus; care must be taken to avoid heating pipes near the larders. The general constructional requirements for these rooms are like those for the rest of the school, but the finishes need special attention. Hardwood blocks are frequently used for the floors of the main part of the rooms, but narrow boards are easier to clean, especially when greasy. Tiles or granolithic are too




Above: Fig. 29 Typical layout of a housecraft unit




Below: Fig. 30 Housecraft room: unit-kitchen type

cold for the general floors, but should be used near sinks, cookers and wash boilers. Thick cork linoleum has been used but it marks with grease, although some of the hard types of the same material may be suitable. Walls require to be washable and are best painted, but materials such as tiles, glazed brick and cold glaze sprays should be used round sinks and draining boards. Windows should be large, but the need for wall space should keep them to the minimum required for adequate lighting. High and cross-ventilation are most important, and special attention to the removal of steam may require special measures. Larder windows should be protected with wire mesh screens.

KEY
T—table
S—sink
M—mirror
C T.—cutting-out table
M.T.—machine table
D.B.—display bench and books
BB—blackboard
W.R.—wardrobe
SH—shelves

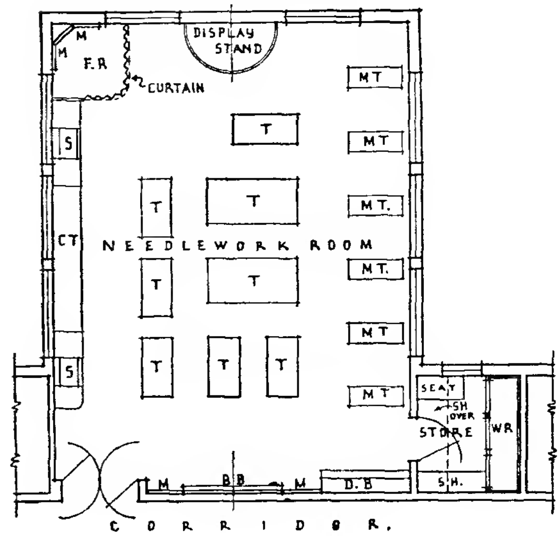



Fig. 31 Typical layout of needlework room

There are two main types of housecraft rooms, for cookery and laundry, but many variations of these are possible ; Fig. 29 illustrates a typical arrangement in which all the equipment for both cookery and laundry is planned along the two side walls and the home management rooms planned as a suite comprising a kitchen, a bed-sitting room and a bathroom adjoining the main room. Lighting is provided mainly on the two side walls over the fixed fittings, leaving the two shorter walls free for larger equipment. Fig. 30 illustrates an arrangement, possibly more suited to senior pupils, based on a layout of fittings to form a series of similar units each complete in itself and arranged somewhat on the lines of a domestic kitchen; in this type it is desirable to have a separate laundry annexe for at least that part of the work which involves the handling of larger articles; such a scheme, however, requires a rather larger floor area and may involve some 1,000sq. ft.

It is important that the planning of these rooms is based on proper layout of equipment and on a correct sequence of operation, as faulty positions make the work of the teacher difficult and also prevent pupils obtaining the best results. The proper sequence of operation due to the placing of equipment also trains the pupils to arrange work in a similar fashion.

For cookery the following equipment is needed: sinks 24in. or even 36in. by 18in., with draining boards on both sides, fitted at various heights from 30in. to 36in. to allow a correct height for each pupil; at least one sink is needed for every four pupils; one (or preferably two) bucket-sinks with grids should be provided. Cookers should be installed at the rate of one for every two or three pupils and should be of varying types, as used in the district; provision must be made for a variety of fuels, including solid fuel, electricity, gas; in rural areas where needed, oil. Other than wall benching no fixed furniture is required; dual tables, 5ft. by 2ft. 6in., are usual, together with stools; these tables must be strong and have hardwood tops. Ample wall benching with cupboards and suitable slatted shelving is needed.

For laundry work the same type of wall benching is used; or alternatively, proper laundry tubs may be installed either singly or in pairs. Wash boilers of the types used in the district, fired by various fuels, should be planned adjoining the sinks or tubs and wringers for the correct sequence of operations. Provision should be made for electric and gas irons and also for heating irons on the top of solid fuel and gas stoves. Overhead flexes should be avoided and plugs should be installed just above bench level. Hanging driers are needed at the rate of one for every three or four pupils and also a large drying cabinet. Local hot-water supplies are desirable by means of electric or gas water-heaters of adequate capacity, unless the rooms are planned close to other supplies available throughout the year.

### Needlework Rooms

In small schools the needlework room may have to be combined with other housecraft work, but whenever possible a separate room should be provided, as the equipment is very different and material may be damaged if cooking or laundry are done in the same space. The needlework room should be at least 850sq. ft., for use by half-classes up to a maximum of 20. Good light is essential on all working surfaces ; sewing machines should be planned to have left-hand light. The equipment comprises tables, 5ft. by 2ft. 6in., and one or two larger tables about 6ft. by 3ft., machine tables, one for every three pupils for hand-, foot- and power-operated sewing machines, a long cutting-out and pressing table, which may well be planned as a wall fitting; the latter should be associated with one or two sinks having double draining boards. A display fitting in which fashion books, plates and reference books may be exhibited is needed and also a large chalkboard and several mirrors, some of which should be arranged as a triple mirror and screened off by curtains to form a fitting room. The needlework store should have an area of about 100sq. ft.: it may also be used as a fitting room and should be fitted with adequate shelving and a large wardrobe cupboard. The floors of needlework rooms should be of hardwood or linoleum. The walls do not require any special finish, but should provide ample display space. Fig. 31 illustrates a layout based on recent methods of teaching this subject. If the room is also to be used for evening classes the store should be doubled, as for the cookery room.

### Science Rooms

No provision needs to be made for the teaching of science in primary schools, and even if it is touched upon in any way, the teaching may either be in a normal classroom or in a general-purpose room.

All secondary schools, however, require special rooms for teaching this subject, and owing to the special equipment, often involving the installation of several services, including drainage in the floors, the location and planning of the science rooms have considerable influence on the planning of the whole school. The number of science rooms to be provided varies according to the size and type of school. The floor area for these rooms should not be less than 960sq. ft.; larger rooms, up to about 1,200sq. ft. are desirable for those general science rooms which have to serve for teaching several differing branches of science, or which may act as a combined classroom and laboratory. Preparation rooms are generally needed and should be attached to the science rooms; they should be about 230sq. ft. each, but often one preparation room can be planned to serve two adjacent laboratories. The equipment can only be broadly dealt with in these notes, and therefore the information given is confined chiefly to information required in the general design of science units, especially with regard to structural requirements.

In smaller schools and in some types of school only one science laboratory is provided; it has, therefore, to serve for the teaching of all branches of science, elementary chemistry, physics and biology; such a room is termed a general science laboratory. When, however, several laboratories are provided, as in many larger schools, these may either be equipped as general science rooms or they may be assigned to the teaching of one branch only and the equipment specialized for the purpose. The rooms are planned on the basis of use by full classes of 30 pupils. Some schools, of the grammar or general type, where pupils remain to the age of 18 years, usually have one advanced laboratory and perhaps one for each of the three branches of science referred to above, especially when the number of advanced pupils is likely to be large; these advanced laboratories are usually smaller in area than the normal laboratories (about 450sq. ft.) as classes are usually small (15 to 20).

Science laboratories of the normal classroom span of 24ft. to 25ft. require a length of about 40ft. to give a floor area of 960sq. ft. and up to about 50ft. for those requiring 1,200sq. ft.; it is often necessary to retain a constant span for ease of planning science units in conjunction with other special rooms. If spans of greater dimensions than 25ft. are used, it is essential that the rooms be lighted on at least two sides and the addition of top light becomes almost essential. In rooms up to 25ft. in width, windows should be planned on one long side and should be so placed as to permit continuous wall benches to be installed below the sill level; windows should not be larger than necessary to light the rooms adequately, as some wall space over the benching between windows is advantageous.

Good ventilation is essential, including proper cross-ventilation, but care should be taken to ensure that windows or borrowed lights provided for the latter purpose only, are high enough to leave plenty of clear wall-space for cupboards, diagrams and models; a good height is at least 8ft. from floor level to sill. Facilities to darken rooms are essential, particularly for teaching physics, and therefore top lights are not very satisfactory. Blinds are sufficient for darkening rooms, shutters being both unnecessary and expensive. It is usually necessary to provide also for the darkening of preparation rooms.

Doors should be kept sufficiently far from the wall behind the demonstration bench to provide space for a lantern screen. Direct access should be provided between preparation or store rooms and the laboratories without the necessity of entering corridors.

A classroom adjoining the laboratories may be used for lecture purposes if a demonstration table and services are provided, but in the more advanced and larger schools a lecture room is often provided and sometimes this has accommodation for two classes. A preparation room should be available adjoining the lecture room. It is convenient when planning the layout of fixed benching in laboratories if floor space can be provided to allow for tables and seating adjoining the demonstration bench. In those rooms in which physics is to be taught, a clear space of some 10-12ft. at one end of the room is desirable for placing and working of larger apparatus.

Benches may be of various types, depending partly on the uses of the rooms and partly on the floor space available. It is usual to arrange benching at right angles to the light to avoid any student standing directly between the light and the working-surface. Single-sided benches are more costly, but they permit all students to face the demonstration bench without moving. However, the more general provision is double-sided benches. Single-sided benches should not be less than 2ft. wide and double-sided benches not less than 3ft. 6in. wide. Gangways between single benches should be at least 3ft. and between double benches at least 4ft. or preferably 4ft. 6in.

Some laboratories have been designed, more particularly for physics and biology, based on the use of about 3ft. 6in. square movable tables accommodating four students each. Wall benches vary in width from 1ft. 6in. to 2ft., those installed under windows should be provided with knee spaces between any cupboards arranged below the working surfaces. Fittings installed above bench tops should be 18in. clear of the tops. The walls opposite the window are usually unsatisfactory for working-spaces, and are more usually used for storage cupboards, exhibit cases, diagrams, etc. Benches of all types are usually 2ft. 9in. high, except for advanced pupils, when 3ft. is more usual.

The demonstration bench is a very important piece of special furniture. This varies in length from 8ft. to 15ft., is usually 2ft. to 2ft. 6in. wide and 2ft. 9 in. high. An extension flap is sometimes provided on one end to increase the length, and a sink should be fixed at the other end. Gas and electricity services are needed and the bench should be fitted with drawers and cupboards.

Science rooms may be placed with advantage in positions having aspects not required for general classrooms, for example on the north side of a block. It is essential that the rooms be grouped together. Top light is useful, and in consequence, science rooms are frequently placed on the upper floors of multiple-storeyed buildings; top light has the advantage of leaving clear the lower portion of walls to receive apparatus and equipment.

Wall spaces should be as large as possible and finished with distempered brickwork or other similar finish and not plaster.

Drainage for the bench and other sinks must be carefully considered in order that it may be readily accessible at all points. Wastes may be either taken to settling basins under sinks and then to the outside, or be led away on easily accessible runs without interruption. A satisfactory system is to lead wastes directly into U-shaped channels embedded in the floor and covered by screwed boards. The floors of laboratories are generally finished with wood blocks, as these have been found to be the most satisfactory material to withstand the various materials which may be dropped or upset, and also because pupils have to stand for much of the time.

### General Science Rooms

As already stated, these rooms usually have to serve for teaching of more than one branch of science; the equipment must, therefore, provide for all purposes and may not be ideal for any one branch. Fig. 32 illustrates a typical general science room for the teaching of elementary work and is based on the use of unit tables; these tables should be 5ft. long for two pupils, but it is sometimes necessary to reduce this length to 4ft. 6in. if sinks have to be accommodated between the benches instead of being planned at the side of the room, as shown; opinions vary very much as to the need for sinks in the benches for general elementary work: they only appear to be really needed if chemistry is one or even the main subject to be taught in the room; if sinks can be kept to the side wall benching and on an external wall the difficulties of services, especially the wastes, are greatly reduced, and the use of movable tables becomes possible. If sinks are wanted in the working-benches, the equipment has to be arranged in a similar way to that shown for chemistry laboratories in Fig. 34. Movable tables are specially useful for the teaching of physics and biology, as large clear floor spaces may be formed at will. Gas and electricity are usually needed on the benches and when movable tables are used flexible connections have to be provided to floor outlets; it is, however, better to confine such services to wall benches whenever possible. In laboratories

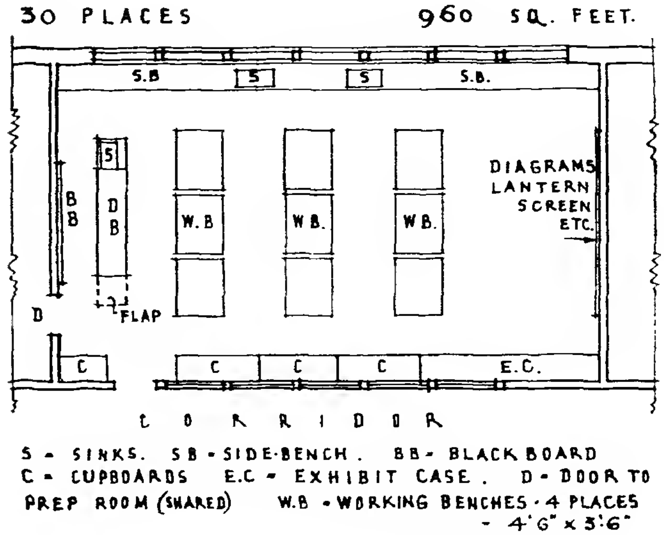



Fig. 32 General science room

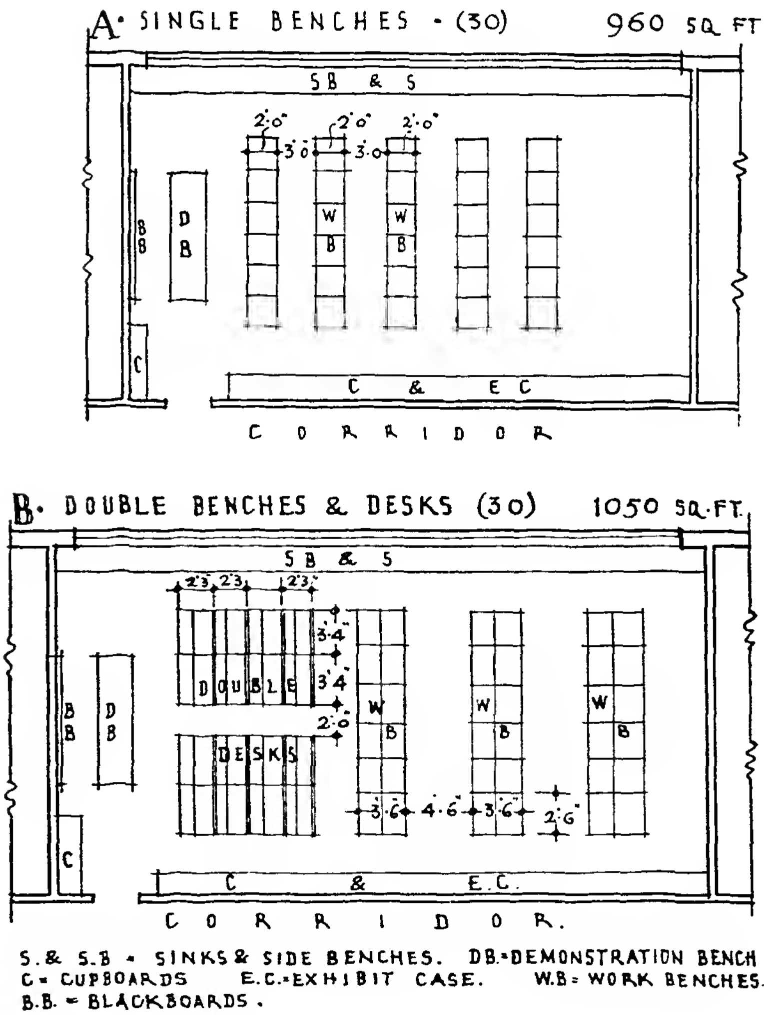



Fig. 33 Alternative layouts for general science rooms

used for biology at least one sink 24in. by 18in. by 10in. overall, of a domestic type, with two draining boards, should be provided; any others should be small chemical sinks about 15in. by 12in. by 8in. overall.

Fig. 33 A illustrates a general science room based on the use of single-sided benches. and 33 B shows a larger room with class-seating in addition to laboratory benches, so that the pupils may be grouped and seated near the demonstration bench and thus have better facilities for note-taking and general written work.

**Chemistry Laboratories**

These rooms are similar in area and generally of the same width as those for general science; although 24ft. or 25ft. is likely to prove a good general span it may be reduced if wall benches are omitted. For elementary work bench lengths of at least 2ft. 3in. per pupil should be allowed but for more advanced work the length should be increased to 3ft. There should be a sink adjoining each pupil's working space for advanced work but two sinks in each 15ft. length of bench are sufficient for general work.

Benches should be isolated to give complete circulation. In the layout shown in Fig. 34 all students face the demonstration end of the room. The normal class of 30 is accommodated on the central benches, leaving the wall benches for special apparatus. Separate balance rooms are not needed, as balances for ordinary use are placed with other apparatus on shelves in the laboratory, except for special balances, which are kept in the preparation room. Balances for more advanced work require about 30ft. run of wooden shelving 15in. wide. All fittings and shelving should be of wood and the use of metal avoided. A furnace is needed in at least one laboratory and is usually placed on a stone shelf about 8ft. long and 2ft. wide, with a hood.

One or more fume cupboards are needed in chemical laboratories and require an area of 3ft. by 2ft., and they are fitted with a gas supply and an exhaust flue.

Advanced chemical laboratories usually need one larger type of fume cupboard, 4ft. by 2ft. 3in., equipped with gas, a sink and water. Benches in chemical laboratories should be 2ft. 9in. high, with at least one drawer per pupil, the lower part clear, and each should be supplied with gas. In addition to bench sinks, one large-sized domestic sink with hot and cold water supply is essential.

**Biological Laboratories**

Laboratories for this subject are better if placed on the ground floor, as access to the garden is desirable, and whenever possible, and especially in rural areas, a greenhouse or conservatory of some kind is needed adjoining the laboratories; if a greenhouse cannot be planned, a Wardian case in at least one window is needed; this is similar to a double window with a space about 2ft. wide between the sides, in which plants may be placed.

Rectangular tables are probably the best type of equipment for this subject, as sinks can usually be placed in the wall benches. Biological laboratories need at least four small sinks and two large sinks, the latter with draining boards on each side. It is desirable to have a material store with direct access from the laboratories.

**Physics Laboratories**

When these are not used as general laboratories strong but easily moved tables form the best equipment. Dual tables (two pupils on each side) about 4ft. 6in. by 3ft. 6in. are more satisfactory than long benches, especially if the latter are fixed, as is more or less necessary with large fittings. If a large clear space about 10ft. or 12ft. wide can be left at one end of the room it is very desirable for large apparatus. Few sinks are needed; these may conveniently be placed at 6ft. centres against the walls and between the tables. Three sinks, one of which is for cleaning apparatus, and requires hot water, are a minimum. Services such as gas and electricity may be needed on all tables and can be arranged with flexible connections or may be supplied from walls or from overhead arms.

The layout of physics rooms of a more simple type is similar to the general science laboratories shown in Fig. 33; more advanced laboratories are similar in regard to equipment, but need rather more space per pupil for apparatus.

Electric power in the form of direct current is often required, and suitable converting plant to produce it may be needed. Each demonstration table should have electrical supplies and about six other points are required.

**Preparation and Store Rooms**

These rooms should have a floor area of about 230sq. ft., and the spaces for the preparation and storage are best combined in the form of one undivided space. The preparation room should be at least 10ft. wide and, if possible, the full width of the laboratory; it should have an external window and ventilation on the opposite wall whenever this can be arranged. The general equipment consists of drawers, shelves, cupboards, a bench, a sink and a fume cupboard. The sink is best placed in a wall bench under the main light of the window.

It is usual to plan these rooms between two laboratories or between a laboratory and a lecture room. Biology rooms and, whenever possible, general science rooms which are used also for the teaching of this subject, should have a material store adjoining; such stores should be about the same size as the preparation rooms.

**Lecture Rooms**

In secondary schools of general type a lecture room is usually required in conjunction with the science rooms. The area needed is 540sq. ft.; this can be developed to seat a class of 30 pupils if a layout based on dual desks with gangways between, as shown in Fig. 35 A, is adopted, but in the same area but with varied dimensions it is possible to plan a layout to accommodate two classes of the same size if continuous rows of desks are used with a central gangway.

Seating should be based on 1ft. 10in. minimum length per pupil and 2ft. 9in. from back-to-back of the benches. The benches should be raised in tiers which are usually either 7in. above each other or in gradually increasing heights of from 6in. to 12in., but there seems little advantage in the latter arrangement in rooms of comparatively small dimensions. A space of not less than 3ft. 6in. should be provided between the demonstration bench and the front row of seats.

The windows must be capable of being darkened. A large movable chalkboard of the sliding type is required on the wall behind the demonstrator and a lantern and screen should be provided. Fig. 35 A illustrates a typical layout for a lecture room and Fig. 35 B shows detailed dimensions for lecture-room seating.

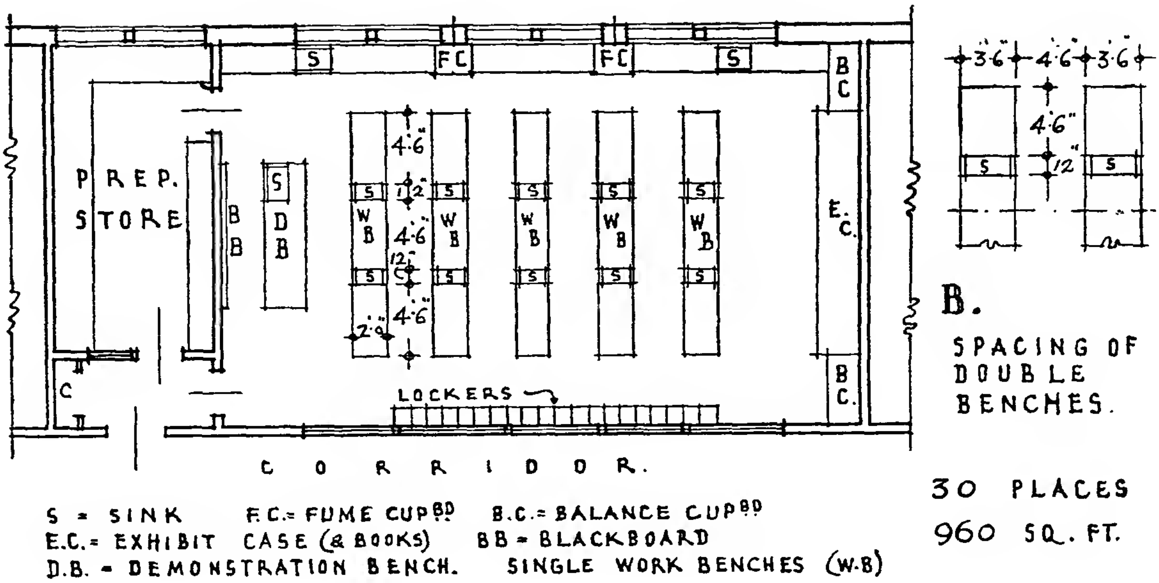
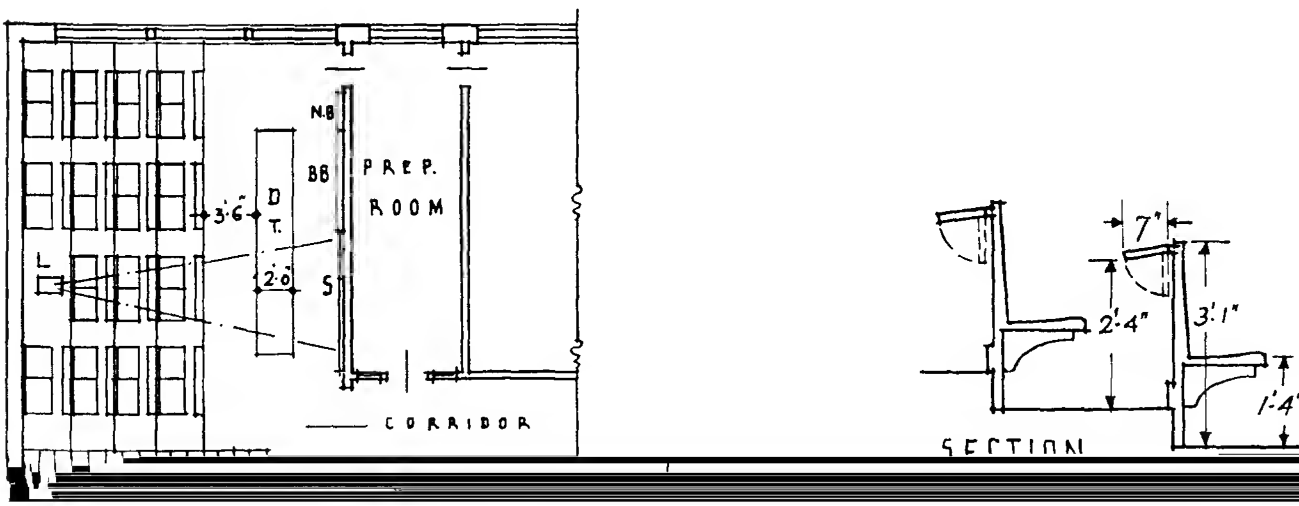



Fig. 34 Typical chemistry laboratory



### Handicraft Rooms

Subjects for which these rooms are planned vary considerably; the two most general being the teaching of simple woodwork and simple metal-work; in those schools, however, having a technical bias, the range of subjects extends to cover all the elementary branches of building, engineering and, in some areas, the needs of other specialized trades.

All types of secondary schools, except those exclusively for girls, require one or more handicraft rooms of at least 850sq. ft., each. When only one room is provided, as in one-form entry schools, it usually combines wood- and metal-work and in some areas, especially rural ones, a forge room or annexe is sometimes provided in addition; when two or more rooms are provided they are usually allocated to one specific type of work and suitably equipped for that one subject only. Workshop rooms should, however, always be grouped together with materials, stores and, when possible, stores for work in progress. In the technical types of school rooms become more specialized and much larger in area—usually 1,200sq. ft. or more and equipment is correspondingly increased.

It is usual to base accommodation on the needs of half classes, with a maximum of 20 pupils. The rooms should be designed primarily as workshops rather than as schoolrooms. It is desirable that the rooms have a width of at least 24ft. to accommodate the equipment adequately, though when independent buildings are used, spans up to 30ft. may be found to be more convenient. If the rooms do not form part of the main building of a school the construction may be very simple. The height need only be 9ft. to the wall plate and the roof may be open with skylights on the north side. Ample light and ventilation are very essential. If, however, the rooms form part of the main building, a height of 11ft. or 12ft. is desirable, with windows on the two long sides when possible and with top light in addition when the rooms can be arranged on upper floors or as single-storey units.

It is convenient if a classroom can be grouped with the workshops for the teaching of mechanical drawing or, if not, the rooms should be increased in size to allow space for drawing tables for a proportion of the pupils.

The floors of handicraft rooms should be covered with wood blocks or boarding to avoid damage to tools when dropped, except in positions near such equipment as a forge, where there is fire risk. The walls are generally of distempered brickwork. Windows should be almost continuous for the length of the room on both sides. Good artificial light is also important, particularly if the rooms are likely to be used for evening classes.

Clothes pegs should be provided in handicraft rooms or, alternatively, lockers which keep the clothing cleaner than when it is hung on pegs. It is an advantage to plan the clothes pegs in an entrance lobby and to place with them some lavatory basins, especially if the lavatory block is not very near the workshops. A first-aid cupboard and additional fire-fighting apparatus are also needed.

Fig. 36 illustrates a typical handicraft room adapted for woodworking. The furnishings consist of double-sided benches about 5ft. long by 2ft. 6in. wide, for one pupil on each side. The benches should be spaced at least 3ft. 6in. apart and 3ft. should be allowed between ends of benches. It is usual to place all the benches in the centre of the room, leaving the side walls clear for plant requirements, such as glue benches, grinders, a sink and tool cupboards. Power-driven machinery is seldom provided in more elementary rooms, but provision must be made for a number of machines in those rooms used for more advanced work. Tool racks may be either against the outer walls or, alternatively, on a screen running down the centre of the room, for which the central gangway must be increased to a width of at least 5ft. Some tools are kept in cupboards in the benches in some schools, but opinions as to the desirability of this procedure vary. Gas points are required for glue pots. The tools and general equipment have been standardized for schools by many firms. In some schools, where both wood- and metal-work are taught in the same room, combined wood- and metal-working benches are available, but it is preferable that a part of the room be devoted to each purpose, the more usual arrangement being to allocate the centre of the room to woodworking benches.

Fig. 37 illustrates a typical advanced metalwork room. For more elementary work the bench portion without the forge annexe is usually adopted. Metalworking benches are usually about 12ft. long by 3ft. wide, providing a working space for six pupils. The wall benches should provide for soldering, and gas points are here required. It is desirable to group machines in these rooms together, preferably at one side of the room. When provision is made for a forge and equipment such as smith's and brazing hearths, a concrete or similar floor should be provided, and also direct access to the open air. Forges require a flue, hood and extract fan and consequently are best placed against a cross-division wall to avoid obstructing window space or external walls. Storage for materials is of great importance, and as the materials are frequently in long lengths provision should be made for racking at least 16ft. long; external access for delivery of materials is essential and also direct access from materials store to workshops. It is usually convenient to place the materials store, with stores for the master and work in progress, together at one end of the workshop as illustrated in Figs. 36, 37 and 38. If the rooms are used for evening classes in addition to day classes, additional storage space is necessary for work in progress. It is desirable, but not always convenient, to provide a large display case with glazed doors in which exhibits of work may take place. A chalkboard is essential in all workshops.

Fig. 38 illustrates a typical carpentry workshop with an area of 1,200sq. ft. for the technical type of school. It should be noted that benches are concentrated at one end of the room, machines at the other and the demonstration bench in the centre. Chalkboards are provided at both ends of the room, and the remainder of one end wall is used for tool cupboards. It should be noted that machines are not placed in rows but staggered to permit of machining of long lengths of material without interference with the work on adjoining machines. Wide openings are provided from outside into the timber store and from the store into the workshop; it is often convenient to use sliding doors for these wide openings, as they occupy less floor space. The machines should be of the types general in trade workshops, but care should be taken to provide only those machines which are not specially dangerous and these only when carefully guarded. It is

desirable to drive machines with separate motors rather than provide power from shafting.

In rural areas the forge should have ample space adjoining in which agricultural implements may be placed for instruction in repair work, and consequently large external openings are essential; it is also wise to plan the forge and metal workshop near other practical rooms or buildings used for training in rural activities.

In all workshops used for teaching in connection with large implements, motor or aero engines, facilities should be provided for overhead lifting tackle.

In technical secondary schools for the teaching of boys between the ages of 11 and 16, and even to 18, the equipment of workshops closely resembles that normally used in ordinary workshop practice. These workshops are usually devoted to one particular trade and the area needed for each is 1,250sq. ft.

Woodwork and carpentry workshops require the benches to be assembled at one end of the room, preferably round a large demonstration bench. The benches are usually dual, 5ft. by 2ft. 6in., and the demonstration bench should measure 6ft. by 3ft. 6in. Machines should be placed together at one end of the room, and care must be taken to allow adequate space for feeding long lengths of material into the machines. It is advantageous to place lathes in front of windows.

Engineering workshops tend to vary considerably in equipment, mainly according to the types of trades carried on in the neighbourhood of the school. In some districts a considerable demand exists for sheet metal work and this requires extensive space with large bench-tops and relatively little power plant. Fig. 39 shows a general engineering workshop, one end of which is devoted to plant requiring heat and a solid floor of incombustible materials. The other end of the room is devoted to general machining. One large fitting bench is provided in the centre of the room, and side benches for part of the length of the side walls. It is desirable that the rooms should be not less than 24ft. span, and it is preferable if the span can be increased to about 30ft., which is often possible where workshops are planned in a single-storey detached block. Direct access to the open air is desirable from most workshops and materials stores.

KEY

B—work benches
TC—tool cupboard
DB—demonstration bench
BB—blackboard
PM—planing machine
BS—bandsaw
MM—mortising machine
CS—circular saw
L—lathe
G—grinder or glue bench
S—sink
SB—side bench or sharpening bench
SSB—soldering bench
BH—brazing hearth
SH—smith's hearth
A—anvil
PD—power drill
F—flue
C—cupboard
LS—lockers
PS—power saw
SHP—shapers
MT—marking-off bench

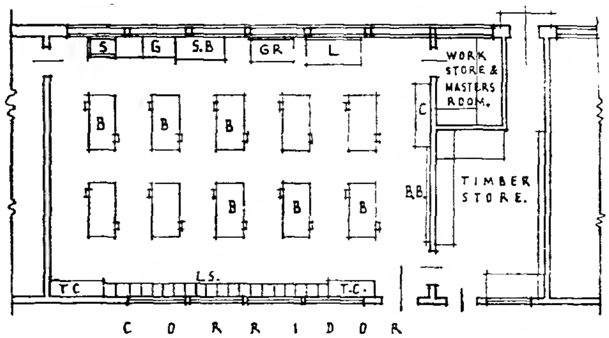



Fig. 36 Typical handicraft room: 15–20 places: 850sq. ft.

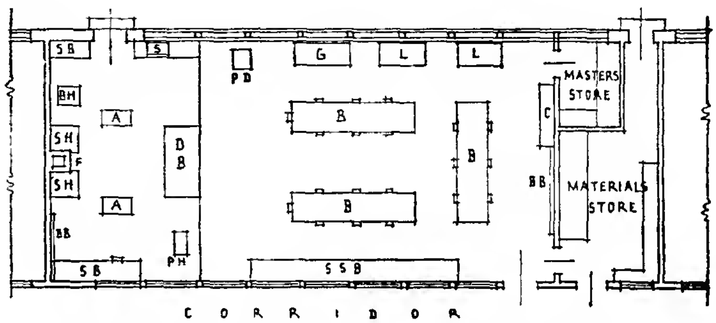



Fig. 37 Typical advanced metalwork room: 15–20 places: 850sq. ft.; 30 places: 1,200sq. ft.

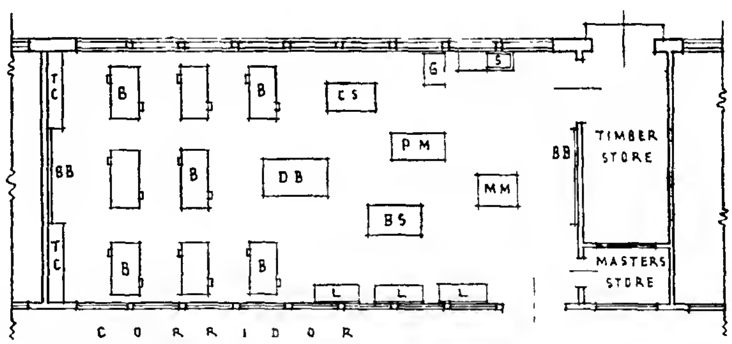



Fig. 38 Typical carpentry room: 15-20 places: 850sq. ft.; 30 places: 1,200sq. ft.

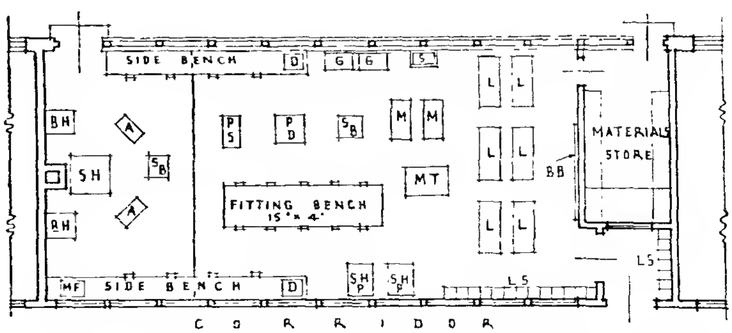
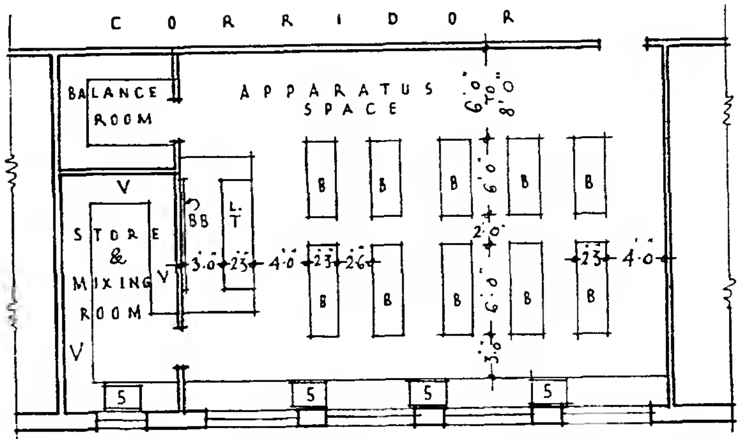



Fig. 39 Engineering and metalwork room: 15–20 places: 1,000sq. ft.; 30 places: 1,500sq. ft.

## SECONDARY SCHOOLS: BUILDING SCIENCE ROOMS, DRAWING OFFICE

### General Building Workshop

The rooms for this purpose require little in the way of special equipment beyond a certain number of benches suitably designed for each trade. Trades most likely to be provided for are: plumbing (if this is not taught in a metal workshop), bricklaying, plastering, painting and decorating; the rooms should have hard floors, water supply to sinks, and plain brick walls. A number of small stores is desirable for materials which, with advantage, may often be divided up into small bunkers or bins. It is desirable that painting should be separated from any trades which involve dust.



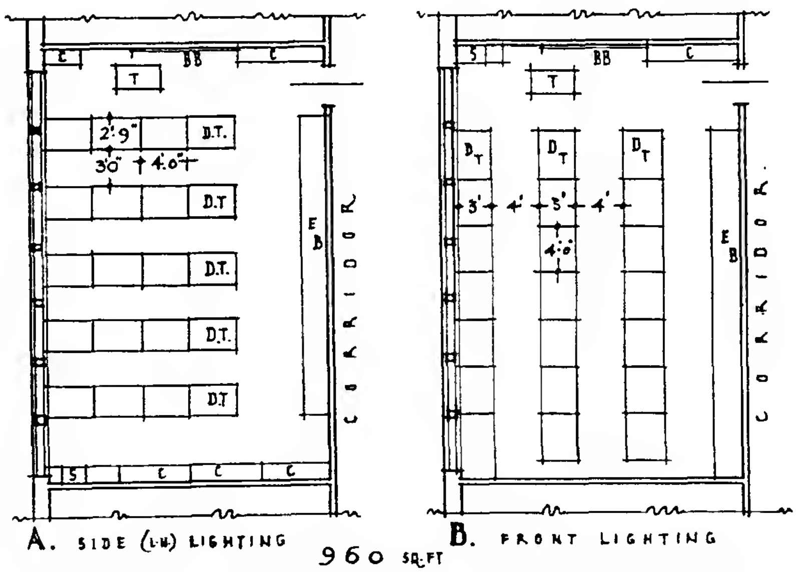

BB - BLACKBOARD LT - LECTURER'S TABLE
B - BENCH S - SINK V - BINS, ETC, UNDER

Above: Fig. 40 Building science laboratory

### Building Science Laboratory

It is frequently necessary to equip one laboratory specifically for the purpose of teaching building science which involves chemistry and physics, but such laboratories can be equipped on very similar lines to the general laboratories. Fig. 40 illustrates a typical building science laboratory; plain-topped benches 6ft. by 2ft. 3in. to accommodate two pupils each are usual, and it is preferable that these be movable, consequently sinks should be confined to wall bench fittings. A large clear space, either at one side or at one end of the room, is often considered essential for large apparatus. A small balance room, in the form of an annexe, is desirable, together with a store- and mixing-room, which should have cupboards, benching and a sink; these laboratories are usually 960sq. ft. in area.

Below: Fig. 41 Drawing offices




T - TABLE. D.T. - DRAWING TABLES. S - SINK BB - BLACKBOARDS
EB EXHIBIT CASES, BOOKS, ETC C - CUPBDS, LOCKERS, ETC.

### Drawing Office

A drawing office is needed in all technical schools, and should have an area of at least 960sq. ft. Drawing offices are apart from and additional to rooms needed for general art subjects, and generally are planned near the building and engineering rooms. There are two main types of drawing office; rooms used solely for the purpose of drawing, and rooms which also have to serve as normal classrooms. In the former, high tables or benches are usually provided, and in the latter, normal height desks or tables have to be used since high benches, even with stools, are unsatisfactory for classroom purposes; it should also be appreciated that such accommodation is makeshift and not suitable for more advanced teaching of drawing. Junior students usually use half-imperial drawing boards and T-squares, and two students can be accommodated in a length of 5ft. 6in., or even three in 7ft. 6in., but it is more satisfactory to allow 3ft. run of table for each student. Senior students usually need larger boards (up to double elephant) and more bench space for instruments, books of reference and drawings to be consulted; a length of 4ft. or even more, according to the type of work, is therefore essential for each student; architectural students, however, may require at least 6ft. The width of tables for general purposes should be 2ft. 9in., and better 3ft., but this is often reduced to 2ft. 3in., which will accommodate an imperial drawing board. The gangways between tables should be at least 3ft. wide, and preferably rather more when larger boards are used; this gangway width is controlled by the fact that students may wish to stand up when working and may need to work

on the long dimension of the drawing boards. Where classrooms and studies are combined, tables of the normal height of 2ft. 6in. should be installed, although tables of lower heights are sometimes used. Normal drawing tables should be 3ft. high, so that students may stand up and work comfortably. Foot rests are desirable on high tables. Tables should have flat tops with blocks for tilting drawing boards. Adjustable drawing boards on stands are seldom provided in schools. Good daylight is most essential in all drawing offices, and the source of light must be in front of the student or from the left-hand side. It may, therefore, be considered more satisfactory to place tables parallel with the window wall instead of facing towards the lecturer's table and the blackboard at one end of the room. Fig. 41 illustrates two alternative arrangements of tables in drawing offices. Diagram A is based on providing left-hand light for students and Diagram B is arranged so that students have the light directly in front. Type A may be found to be more convenient where students have to take notes or make drawings from diagrams on the blackboard. It should be noted that where there are long rows of tables as in Diagram B the gangway spaces should be increased to a minimum of 4ft. to allow circulation without undue disturbance to seated students. At least one large wall area should be available for the exhibition of drawings, diagrams and models: as the latter are liable to become very dusty, glass-fronted cases could well be included in the equipment. It is essential that each room is equipped with a deep sink and a draining board. Where planning permits there should be direct access from the drawing office to an adjacent store without entering the corridor. If the room is regularly used by one class it is desirable to provide lockers in the drawing office; these lockers should be large enough for the storage of privately owned reference books, instruments, etc. Blackboards are essential, and it is usual to provide a lecturer's table or desk, although for the teaching of some subjects this may be considered unnecessary. The aspect of drawing offices should, where possible, be to the north or north-east. It is an advantage to have top light in addition to side light, to give adequate light to the desks farthest from the window wall.

Ample space must be provided for the storage of drawing boards, T-squares and drawings. If rooms are likely to be used also by evening students, the amount of space necessary may be considerable, it being desirable on many occasions that unfinished drawings should not be removed from drawing boards and the storage must be arranged in a manner to avoid damage. The best method seems to be to provide racks for the vertical storage of boards inside cupboards which can be closed to keep dust away from the drawings. Racks should be provided for each size of drawing board used, with an allowance of approximately 3in. from centre to centre of boards. T-squares can be stored with the boards or suspended on separate racks. Many departments require considerable storage space for the models and samples used for demonstration purposes; these can be placed on shelves in cupboards, if their size will permit, so as to eliminate constant cleaning and reduce the likelihood of damage. The storerooms should, if possible, occupy a space the full width of the rooms and 8ft. to 10ft. wide.

### Typewriting Rooms

Special rooms adapted for the teaching of typewriting and office routine are required in commercial types of secondary school. The floor area recommended is 900sq. ft. Normal typists' tables, as used in offices, 3ft. by 2ft., form the main equipment. Each pupil requires a separate table; good daylight, preferably from the left side, and good artificial light from local individual sources are essential. Gangways should be 2ft. and better 2ft. 6in. wide for general circulation and access to one side of every pupil's place; the rows of tables should be planned not less than 3ft. apart to allow adequate seating space. The seating usually consists of typists' adjustable chairs of a normal type.

In view of the noise created precautions should be taken to prevent disturbance to the surrounding rooms by the introduction of sound-absorbent materials in the walls and in floors and ceilings of a multiple-storied building.

In addition to the typists' tables and chairs it is usual to provide two or three filing cabinets, one or more duplicating machines, a teacher's table and ample cupboard space for the storage of supplies and books. On the teacher's wall a chalkboard is needed, and also facilities for the display of large diagrams. If the room is used as a form room, book lockers should be provided, unless accommodation is available in corridors or elsewhere.

Fig. 42 illustrates a typical layout for a typewriting room based on the space requirements for 30 pupils.

### Rural Activities

There is a growing tendency to make provision in schools in rural areas for the teaching of subjects directly allied to rural life, such as horticulture and agriculture. As this tendency develops, suitable buildings, specially designed for these purposes, will be needed in addition to those already mentioned, such as biology laboratories with a greenhouse attached, and handicraft rooms with annexes for the repair of garden and farm implements. When space permits the greenhouse should be detached and thus not shaded by adjoining buildings and planned, if

KEY
D—duplicator table
TT—teacher's table
NB—notice board
FC—filing cabinet
SL—lantern screen if required
S—sink
C—cupboard
B.B.—blackboard

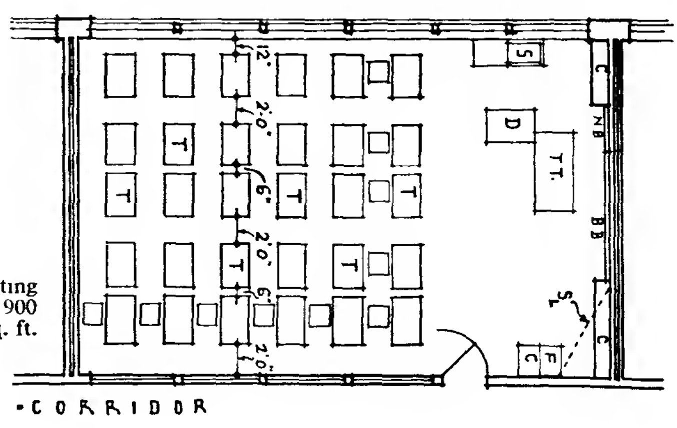



Fig. 42 Typewriting room: 30 places: 900 sq. ft.

possible, in proximity to both the biology laboratory and to the gardens. A covered space partially enclosed by walls should be planned for the storage of implements and supplies such as fertilizers. This space should also provide benching on which operations, such as potting, may be carried out. It is desirable, also, to arrange for an enclosed frost-proof room in which storage of horticultural produce may be demonstrated. It is essential that all these provisions are planned near the gardens, but it is also advantageous if they be not far distant from general workshops and science laboratories.

In schools in which subjects allied to agriculture are likely to be taught, there may arise a need for a miniature farm, providing suitable buildings for the keeping of rabbits, pigs and possibly, cows. Fodder stores will be needed, appropriate to the animals to be kept, and in the case of pigs this will involve provision for the boiling of swill. A dairy with heating plant and a space large enough for cheese- and butter-making by a number of pupils at the same time may also be required. The latter should probably have an area of at least 900sq. ft. in order that it may be used as a classroom for lectures and demonstrations in connection with the farm work. It is desirable that farm classrooms are planned round an enclosed courtyard. Covered space for the storage of implements and an enclosed garage may also be needed.

### Music

No specific provision is made in the Building Regulations, nor in the accompanying Memorandum for the teaching of music and allied subjects. For class teaching of singing and subjects such as appreciation of music, it is quite usual to use the assembly hall, which is also used for training in the dramatic arts.

In secondary schools, where instrumental music is taught, provision may have to be made for a room large enough to hold a small orchestra for rehearsal, although again, it is likely that the assembly hall will be used for the purpose; but for the teaching of individual instruments and for practice, small rooms are necessary; these rooms should be about 8ft. by 6ft. 6in., or slightly larger.

Practice rooms should be placed, wherever possible, away from the main school buildings to prevent sound penetrating through open windows of other rooms, especially classrooms; each room should be sound-proofed from its neighbour. To achieve real sound elimination between rooms, very special care should be taken in construction; single-storey buildings can be dealt with more easily.

### Libraries

A special room to serve as a library is not usually provided in primary schools, but it is advantageous to provide some cupboards and shelving in one of the general-purpose rooms, where books may be kept systematically as an encouragement to pupils to learn to use a library. In secondary schools a special room is required to be set aside for the purposes of a library, and the Regulations require that an area of 600sq. ft. should be allocated in smaller schools (one-class entry) and 960sq. ft. in the larger types of school, increasing to 1,200sq. ft. to 1,500sq. ft. in grammar schools with many sixth-form pupils. These library rooms usually have to serve for the dual purpose of study and recreative reading, and have therefore to provide facilities for working from books under the guidance of a teacher and also be available during the mid-day recesses and after school hours as general reading rooms; more particularly, in view of the latter, it is undesirable that the library be used as a teaching room, as is so often the case, even for sixth-form or similar advanced pupils. The room should be in a pleasant position, quiet, central in relation to all parts of the school and well lighted.

Windows must be well arranged so as to leave adequate wall space for shelving, either against or at right angles to the walls. A very helpful report, "Libraries in Secondary Schools," was prepared in 1936 by the Carnegie United Kingdom Trust, in which much useful information is given; this report suggests that "no library can be considered as adequate which does not provide thirty-five or forty square feet of space per pupil" based on the maximum number estimated to use the room at any one time; this area should be inclusive of shelving, tables, chairs and gangways. The ordinary classroom height is adequate as shelves extending to a greater height than 7ft. 6in. are out of ordinary reach and consequently valueless. A good general average area for windows is 20 per cent of the floor area. Windows are more satisfactory if the sill levels are 4ft. 6in. above the floor so that bookcases may be placed below them and the attention of readers not unduly distracted by too open a view; some authorities, however, suggest that the room is more attractive and pleasing to the children if the window sills are at table level (30in.); if, however, alcove or bay layouts are adopted, sill levels should be lowered to table level.

Open shelving (not closed cases) should be used throughout to provide easy access to books; shelves may be plain wooden or metal shelving, and should always be vertically adjustable. Bookcases are generally arranged in standard lengths of 3ft. or 3ft. 6in., sometimes subdivided to give extra strength for heavy volumes. Island cases with books accessible from both sides have an average overall width of 20in.; frequently, however, provision is made for large books in the lower part, which is made from 2ft. to 3ft. wide, thus forming a shelf on each side about 2ft. 6in. above the floor. Wall cases are usually 10in. deep, although it is sometimes necessary to make provision for some large books by having 12in. deep shelving, the depth being dependent on the type of books needed in the library; technical books are often somewhat larger than other types. Fig. 43 illustrates the main dimensions of typical school library shelving.

Cases projecting from walls should be at least 6ft. apart, unless tables are placed between them, when 10ft. is necessary. Bays in which tables are used should not be too deep for easy supervision, but 9ft. 6in. is needed to accommodate a table for six persons, allowing circulation space on the window end, as is illustrated in Fig. 44.

Fig. 45 illustrates two typical library plans. Diagram A shows a room based on 960sq. ft., arranged to provide alcove tables and seating; the island bookcases forming the alcoves being placed with one end against the window wall, so that the tables may be reasonably near the light, leaving the less well lighted parts of the room for general circulation; libraries based on this type of plan provide a large amount of shelf space relative to the floor area. Diagram B illustrates a smaller library based on 600sq. ft. area, in which the shelving is confined to three walls with

a small additional space below the windows. Tables in the library should always be movable.

If reading alcoves are provided on both sides of the room, a very considerable increase in width is needed. A table to seat three persons on each side should be not less than 6ft. long and is better if 7ft. 6in. long, especially if used for classwork, where reference to books is constantly needed. Double-sided tables should not be less than 3ft. and single-sided tables should be 2ft. wide. If island bookcases are used on both sides of the room, gangways between the ends of these cases should not be less than 6ft., and if a central table is required then the width should not be less than 12ft. to provide for a table 3ft. wide with chairs on both sides. It is essential to have adequate space in alcoves to allow circulation between the chairs and the face of the bookshelves. When alcoves 9ft. 6in. deep are used on each side of the centre gangways, the total width of the room should not be less than 31ft. between walls, and this width is likely to be inconvenient in many plans unless the library is planned as an independent block; the plan shown in Fig. 45 Type A is, therefore, likely to prove the most useful, as this scheme can be accommodated in widths of 20ft. to 24ft. Books are heavy and floor loads up to $1\frac{1}{2}$cwt per sq. ft. should be allowed. The floors should be finished with a material to reduce noise to a minimum, but must combat hard and localized wear, as most traffic tends to occur near the shelves and particularly in aisles between closely-spaced island shelving. Compressed cork or heavy linoleum have proved satisfactory.

Some subsidiary rooms and spaces are desirable in addition to the library itself, but such are often difficult to provide in schools; the librarian should have provision for keeping records, and such a room would also serve for the librarian's workroom.

Except in very large schools it is undesirable to provide departmental libraries as part of individual departments, and it is better that all the books of the school be combined to form the one main library.

In all libraries, especially those to be used by the more advanced students, proper provision should be made for catalogues, general reference books and the display of new acquisitions. *See also* Part 1: Storage.

Fig. 43 Library shelving data

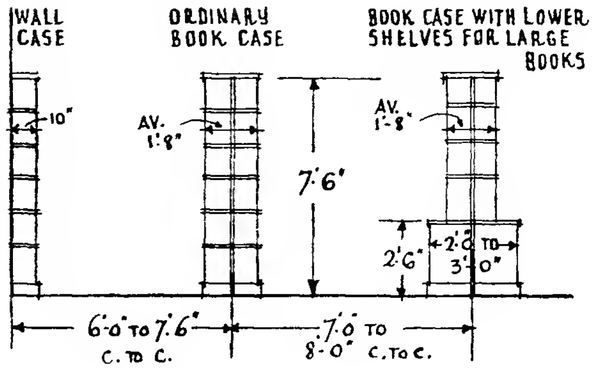
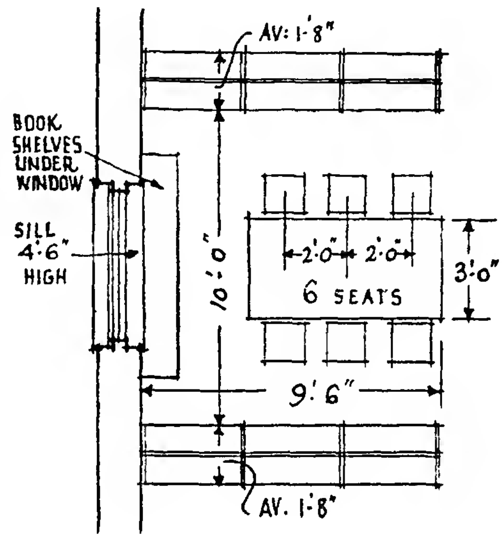



Fig. 44 Data for alcove planning



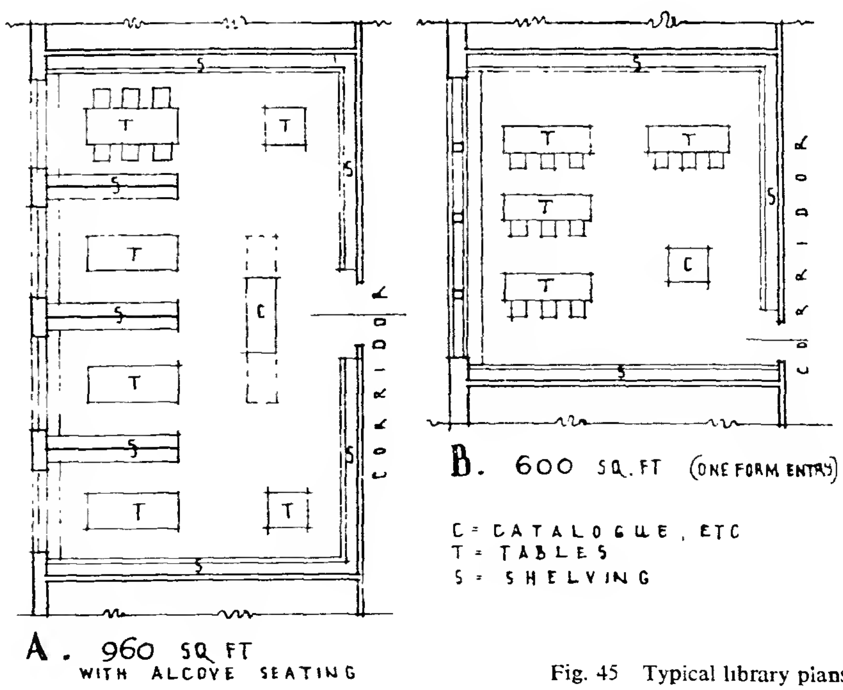




Fig. 45 Typical library plans

### Assembly Halls

An assembly hall is required in all schools; the value to be derived from the many uses to which school halls can be put is becoming more and more realized, both for the pupils and teaching and in connection with events when the presence of parents is desirable. In many districts it will also be needed for such essential activities as old pupils' gatherings, Women's Institute meetings and similar local community functions. This is especially applicable in country districts where village halls are not available.

Assembly halls have been used in the past for physical training, to the detriment of the proper uses, and except in one-form entry types of secondary school, the regulations now require separate gymnasia for all secondary schools, but in primary schools no gymnasia are called for.

Halls should be so planned that noise arising from singing or games does not disturb pupils in the classrooms which should, in no circumstances, open directly from the halls. Halls should be separated as much as possible from teaching rooms, and are therefore most satisfactory if partially detached from the main classroom blocks. Aspect is of little importance, but good light and whenever possible cross-ventilation, is essential. When halls are to be used for outside activities, the importance of approach so that visitors do not pass into the school proper is important, as has already been discussed in connection with the general layout of school buildings. It is an advantage if cloakrooms can be planned in close proximity to the main entrance to an assembly hall, to be available for use in connection with any function which may take place in the hall.

Where there is a number of separate departments in a school it is usually more convenient for each department to have its own assembly hall, unless each has only small numbers, when one hall will suffice if planned conveniently for all departments.

In secondary schools the areas are rather greater; for two-form entry, 2,000sq. ft. and for three-form entry, 3,000sq. ft., which is equivalent approximately to 6sq. ft. per pupil.

Seating in halls is generally most satisfactory when some form of stacking or nesting chairs is used. If the room is to cater for outside purposes and is, in consequence, to be licensed for music and dancing, it is necessary that the chairs can be battened together in banks of not less than four, and in very large halls it may be necessary to provide floor fixing for the seats adjoining gangways. A gallery is often provided and allows an increase in seating capacity without a proportionate increase in main floor area. By combining in a single block some of the other larger rooms of a school, such as the dining-room, with the hall, great advantages can often be obtained from such combined accommodation. For younger children square halls have advantages, being more adaptable to the varied activities of these age groups.

Fig. 46 illustrates a typical hall layout which has a main entrance directly in front of the main entrance to the building, and the corridor is widened to provide a crush space. Staircases to galleries and to projection rooms should not deliver into the hall itself, nor should they be so placed as to cause confusion in the main traffic ways. A corridor is placed on one side to provide covered access from back to front of the hall and as part of the main circulation of the hall; emergency exits from the hall deliver into this corridor, one of which should be near the stage.

Acoustics are very important, both for the speaking voice and for music and singing. The shape of the hall is consequently of basic importance and long narrow rooms should be avoided; for good acoustics the hall should not exceed 30ft. in height and heights of 20ft. to 22ft. will usually be found to be adequate; it is desirable that consultation with an acoustical authority take place in the early stages of the design of any hall which exceeds 50,000cu. ft. Good ventilation is very necessary and should be by means of windows which should extend as near to the ceiling as possible. Facilities for the easy darkening of the hall are essential. Adequate entrances and exits are also important, especially the latter in order that the room may be cleared rapidly. The floors of all halls should be level to permit of activities such as dancing, but the gallery floors may be stepped to provide better vision. Fig. 47 illustrates two typical sections through halls; the heights are greatly influenced by whether or not a gallery has to be provided. It is desirable that there be a minimum height of 10ft. between the floor of the hall and the under-side of gallery to ensure adequate vision of the stage and any projection screen provided. It is also desirable that there should be 10ft. head-room between the top level of the gallery and the ceiling of the hall. Lantern or cinematograph projection also has a bearing on the heights of halls, as it is essential that the lower edge of the screen should be not less than 5ft above platform level to avoid interruption of the view if people are seated on the platform, or if there is furniture standing on it. It is also essential that the aperture between the projection room and the hall be placed at such a height that the beam is not interrupted should people be walking about in the hall or gallery. The projection room should be at least 8ft. high and it is desirable that it should have a width of 10ft.; an area of at least 100sq. ft. should be provided for the projection room. It is essential that the lines of vision be carefully worked out for all the seating in halls, particularly in regard to the cinematograph screen. Very wide halls are undesirable as the angle from the outer seats tends to become most unsatisfactory. It is desirable that any speaker outlet forming part of the projection apparatus should be placed close to the screen and a position above and in the centre of the screen is likely to be the most satisfactory. If an amplifier system is installed to assist speakers on the platform, the speaker outlets used in conjunction with it should be so placed that the volume is evenly distributed over the whole floor area. It is essential in all new schools that an installation for the dissemination of broadcast reception be installed and that provision be made for cinematographic projection. Care must be taken in the planning of the projection room to provide the usual safety precautions, as it is possible that films other than of the safety type may be used in such buildings. The planning and equipment of a projection room suitable for schools should not, however, involve great difficulties.

If possible the assembly hall should not be used as a passage room; approaches and exits are better if under cover, but direct access to the open air opposite emergency exits should be provided as shown in Fig. 46. Artificial lighting needs special attention in order to provide an even intensity of 8 f.c. over the whole area.

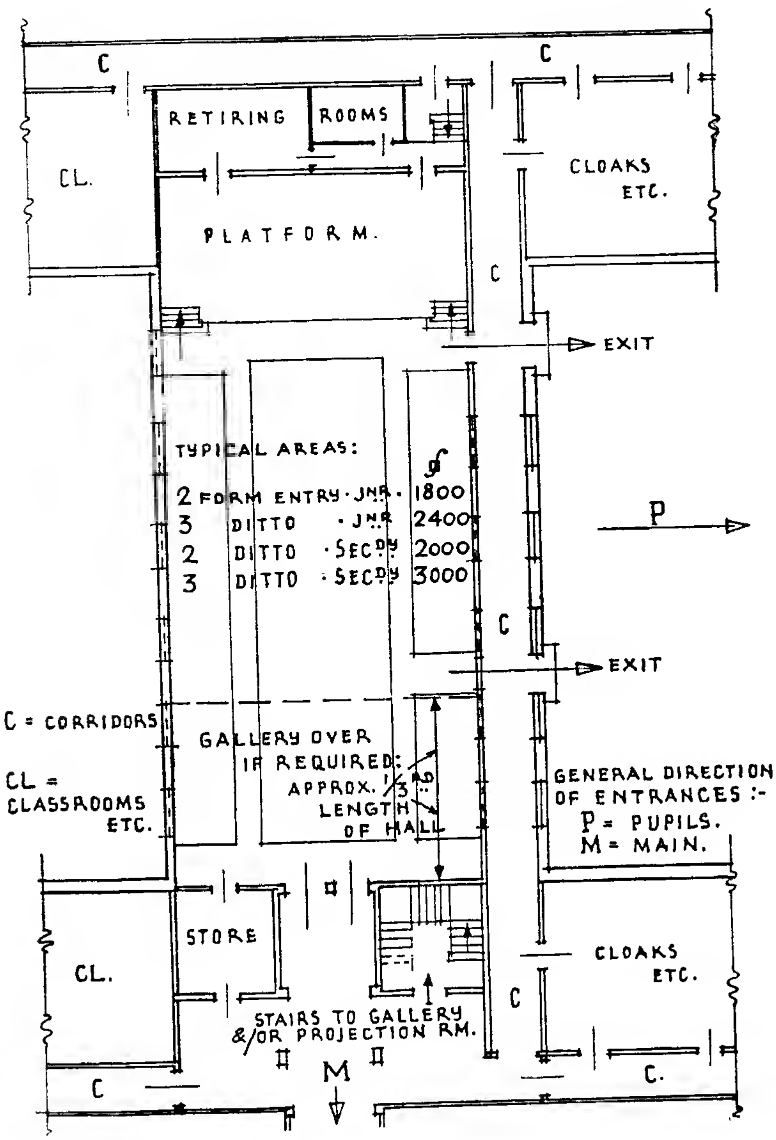



Fig. 46 Typical assembly-hall layout

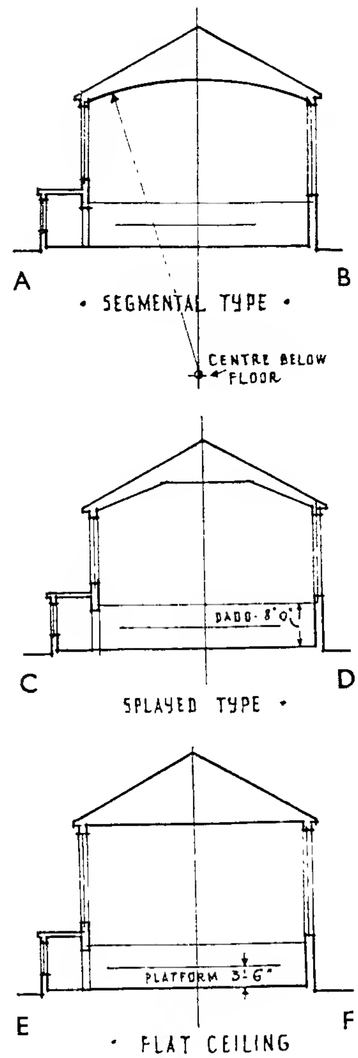



Fig. 48 Cross-sections. Note: height should not exceed 30ft. unless special acoustic precautions are taken

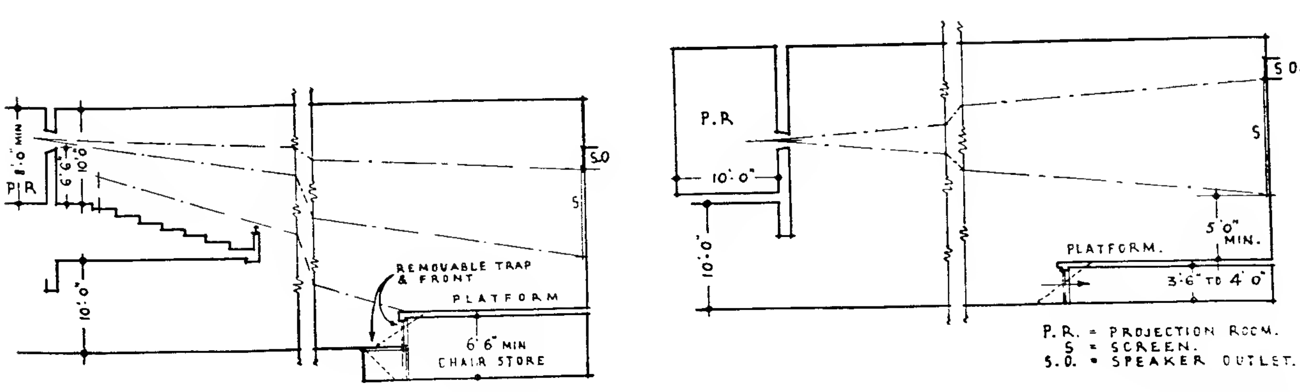
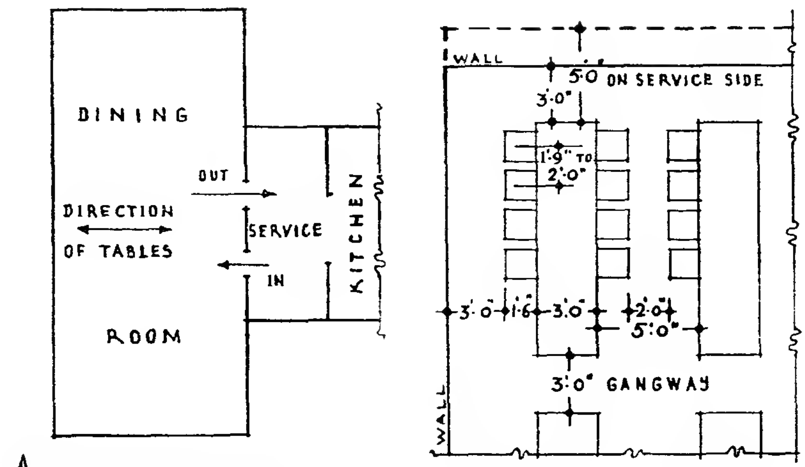



Fig. 47 Typical long sections A With gallery B Without gallery

## SECONDARY SCHOOLS: ASSEMBLY HALLS, SCHOOL MEALS

Ceilings of halls are best flat or shaped as shown in Fig. 48, Diagrams C and D; if curved the centre of curvature should not be at or slightly above floor level but well below. The various sections shown on Fig. 48 also indicate the varying window heights (and consequent amounts of light) for each type. Half of each section, Diagrams A, C and E, shows corridors adjoining the hall. Types A to F are of satisfactory sections for good acoustics, but barrel sections should be avoided. A dado 8ft. high is shown round the walls and should be of wood or plywood panelling to reinforce the voices of speakers; this panelling area should be cut up as little as possible by doors, while windows are better kept above the 8ft. level.

In each diagram the maximum ceiling height has been made 30ft. above the floor level, so that it will be noted that a flat ceiling permits the maximum of window area but results in a building with a greater total height.




A · RELATION OF SERVICE TO DINING ROOM.

OVERALL ALLOWANCE:
8 SQ. FT. – JUNIORS.
9 SQ. FT. – SENIORS.

B · SPACING & SIZES OF TABLES, ETC.

Fig. 49 Dining-room data

### Platform

A platform or stage is required in all halls. Many primary schools use only movable platform units, but in secondary schools the stage is usually fixed. Some schools provide only a small platform for speakers, in which case it should not be less than 7ft. wide in order to have space to pass behind persons seated at a table. It is desirable, however, that greater depths should be provided in order to allow space for play-acting. The stage should be considered as additional space to the area prescribed for the hall. The platform should be the full width of the hall and not less than 20ft. deep which, with a temporary proscenium, allows ample space for a play-acting area 20ft. by 17ft. Platforms are usually about 3ft. 6in. high above the general floor level. A fixed proscenium is not necessary and curtains may be used for the purpose.

The most suitable floor for halls is hardwood strip or wood block. Hard plasters should be avoided on walls as these are acoustically bad and reverberation may be reduced by the use of lime plaster without a finishing coat of distemper for ceiling and walls above the dais, and by covering the wall behind the audience with absorbent material. The carpeting of the floor of the gallery and the platform may also be helpful.

An important consideration is that of storage of furniture so that the hall area may be cleared of chairs when necessary. Storage should be ample in capacity and readily available; it is frequently found convenient to form a storage space under the platform with access through the stage front. Fig. 47 illustrates how this store may be provided under the platform. It is desirable that a clear headroom of 6ft. 6in. be provided, otherwise the handling of furniture becomes difficult. It is also desirable that access be not confined to a small opening in the front of the platform, but that a portion of the floor be also made removable. If access through the front only is provided, it will be found extremely difficult to clear large pieces of furniture, such as tables, into the store.

One room, or better, two rooms should be available for use as dressing-rooms for the hall stage; a room or space which can be used as a "green room" is also very helpful. Changing rooms attached to the gymnasium can sometimes be planned for use as dressing-rooms for the hall. Where the platform is likely to be used for dramatic performances, a simple system of stage lighting is essential; this should comprise footlights, and two or three suspended top battens together with one or two floodlights fixed in the hall itself. The lights should be capable of being dimmed, and full control of the stage and hall lighting should be available on or near the platform itself.

### School Meals

The regulations require the provision of kitchen units in all schools and the Schedules of Accommodation require the provision of rooms for meal service for every primary school having seven or more classes and for all secondary schools; in small primary schools and in nursery schools the meals are often served in classrooms.

At the moment all buildings and equipment for the school meal services are provided by the Ministry of Education in conjunction with the Ministry of Works, but it seems probable that there will be changes in this policy when the supply position becomes easier and when new permanent school buildings are being erected in which the dining-rooms and kitchens form a part. The Memorandum on the Building Regulations gives a very considerable amount of information regarding kitchen and dining-room planning and equipment in Appendix 3; this document refers to the standard plans in use for the war-time programme of the school meal service, and suggests that general layouts and particularly the amount of equipment, can be adapted from present schemes, based on prefabricated huts, to suit permanent buildings. The

Memorandum points out that broadly there are three types of kitchen; firstly, central kitchens supplying meals to a number of schools in one area, the distribution being by means of insulated containers; secondly, kitchens on the same site but separated from the dining-accommodation, which is a type of layout to be avoided at all costs in permanent building; thirdly, kitchens with direct access to the dining-room through a servery; the last arrangement is probably the most satisfactory and it is probable that it is cheaper to operate than the first unless there is a number of schools in a relatively small area.

The more recent Bulletin No. 2A stressed that there should be the utmost freedom in planning of the dining-arrangements and in place of special dining-rooms asks for " suitable accommodation "; thus teaching spaces, halls, gymnasia and general circulation spaces may all be used, in spite of inconvenience and cooking smells, as means for securing economy in cost of construction.

It is suggested that dining-rooms should be based on 8sq. ft. per person for primary schools and on 10sq. ft. per person in secondary schools. The Regulations suggest the provision of a dining-room area based on 65 per cent of the school population divided into not more than two sittings; it seems likely, however, that there will be a gradual extension of the school meal service and that areas based on numbers up to 100 per cent of the pupils may be needed, again divided into not more than two sittings. The Memorandum already referred to gives detailed information as to the overall areas of kitchens and the areas of ancillary rooms needed to serve varying numbers of meals. Dining-rooms should be light, warm and well ventilated, of the simplest nature with all surfaces, especially the floor, designed for easy cleaning. Tables should be not less than 2ft. 6in. and preferably 3ft. wide; each pupil should be allowed at least 1ft. 9in. and preferably 2ft. run of table. Gangways between tables should allow not less than 4ft., but 5ft. is much more satisfactory, particularly if the longer type of table is used. Main gangways should not be less than 3ft. in the clear between seating and preferably more; tables seating more than four people on each side are difficult of access unless adequate gangway space is provided. Fig. 49 illustrates the general relationship of dining-rooms to service space and kitchen in Diagram A and Diagram B illustrates typical spacing for chairs and tables. Benches are more economical in seating space than chairs, but their use would appear to be undesirable. The layout of tables should be related to easy traffic in and out of the servery. When self-service is adopted, as is becoming general, it is important to provide adequate lengths of counter and adequate circulation space adjoining the counter in which queues can stand without interrupting the general flow of traffic.

The kitchen should, if possible, be on the same level as the dining-room and have direct communication with it. Care should be taken to prevent cooking smells entering the main school building. Access for deliveries of supplies must be so arranged that vehicles can be unloaded at the service entrance to the kitchen. The larders and storerooms should have northern or eastern aspect and, if possible, the kitchen should be similarly situated; good light in the latter should be obtained by means of units high in the walls, leaving clear the lower part of the walls for apparatus; top light should be provided, especially if the kitchen approximates to a square on plan.

The size of the kitchen is entirely dependent on the numbers to be catered for and is slightly influenced by whether service of other than mid-day meals is required. Ample hot water and steam are needed, and the kitchen should be thoroughly equipped to save all possible time and labour. Larger kitchens require a staff room and, except in the smallest kitchen, separate cloakroom, lavatory and W.C. accommodation should be provided for the staff of the school kitchen.

### Gymnasium

A properly planned and equipped gymnasium is required in all secondary schools; except that it may be combined with the assembly hall in one-form entry schools. In the one-form entry size, the room requires the minimum area of 1,800sq ft., but in all other schools the area is now required to be 2,800sq. ft., which is a considerable increase on past practice. In the past the normal or standard size has been 60ft. long by 30ft. wide, whereas the new requirements indicate a room 70 ft. long by 40ft. wide. The height should be not less than 18ft. The room is often separated from the main school building because of noise and to permit of lighter and cheaper construction. If the building is separate a covered connecting way to the school is often considered necessary. In view of the new regulations, except in very special cases, the gymnasium should not be used for any purpose other than for physical training. Aspect is frequently not considered, but it is very advantageous if one long wall can be opened towards the south for a considerable part of its length, with suitable doors and a space for open-air exercise adjacent, though it may be difficult to accommodate enough wall bars on the remaining walls. Any such arrangement will necessitate a redistribution of wall bars and a different layout from that shown on Fig. 50. The gymnasium should be on the ground floor and if suitably planned its changing rooms may be used also in connection with the playing fields. The size and equipment of the gymnasium is based on classes not exceeding 30 pupils. It is desirable that gymnasia have flat ceilings with window heads placed as near to the ceiling as possible. Good lighting and cross ventilation are essential: windows are best kept above the wall bar apparatus height, which are 9ft. 9in. overall, but as this is difficult to achieve it is usually necessary for the wall bars to pass in front of the lower parts of the windows. Sometimes windows are installed with sill levels at about 3ft. above the floor and are covered by the major part of the apparatus. Adequate space between windows is required to provide fixings for large apparatus, such as beams, but apart from this the windows should be as continuous as possible on the two long walls. Centre-hung casement-type windows are probably the most satisfactory, as they open for the full amount of their area. Roof lights are undesirable and complicate the fixing of apparatus. Care should be taken to plan the necessary metal work and to arrange for the fixings of apparatus during the erection of the building. Window ladders are generally provided on one end wall and as two units are desirable it is better if these are separated by about 3ft. to allow for the fixing of goals for basket ball on the centre line of the room.

Artificial light should provide a good diffused light of 8 f.c. intensity at floor level, and the lamps should be placed close against the ceiling and should have wire guards, so that the ball games may be played without danger. It may even be possible to recess the lighting so that it is flush with the ceiling.

Galleries for spectators are not generally necessary, but if provided should not connect directly with the gymnasium, but have an approach staircase from a lobby or corridor, preferably near the entrance to the gymnasium.

A most important feature of construction is the floor, which can almost be regarded as part of the apparatus; it should be constructed of boards of close-grained hardwood, free from knots in narrow widths to avoid shrinkage and laid across the gymnasium and not longitudinally; boarding should be laid on joists to increase resiliance. Maple has often been used, but there is a tendency for this to become excessively slippery.

The walls of gymnasia are best finished with smooth plaster, but it is an advantage to have acoustic plaster or other sound-absorbing material on the ceiling to reduce noise. Stanchions or piers are more satisfactory if placed outside the room to avoid breaks on internal wall surfaces which are required for the apparatus.

Heating (not open fires or stoves) is required to maintain a temperature of 55° F.; radiators should be placed in recesses in the wall if possible.

### Gymnastic Apparatus

The following apparatus is usually provided for a normal class of 30 pupils:

*Fixed Apparatus*—Thirty-two wall bars, four single-span double-beams, two vertical window ladders, each six squares wide (approximately 10ft.), twenty climbing ropes.

*Movable Apparatus*—Eight beam saddles, ten balancing benches, two jumping stands, one vaulting horse, one vaulting buck, four mats, one agility mattress, one beating board.

Shelves are required for the beam saddles, racks for apparatus such as clubs, boxing gloves, foils, single-sticks, and hooks for the suspension of mattresses.

The apparatus is covered by B.S. 1892 which represents the recommendations of the Ministry of Education.

Wall bars are generally placed at 2ft. 9in. centre to centre of vertical supports; beams may be single or double span, although single are the only type possible in the wider gymnasia; the beams should not be less than 13ft. long, nor should they exceed 15ft. long. Fig. 50 indicates the general spacing and positions of apparatus for a typical gymnasium.

A large apparatus store is essential adjoining all gymnasia. An area of approximately 180sq. ft. is desirable and the minimum dimension should be not less than 10ft. This store should have as wide an opening to the gymnasium as possible; a roller shutter should be used, rather than the normal large types of doors, to avoid occupying useful floor space. A room for the instructor is essential; in it some storage space for smaller apparatus should be arranged; it should act as a changing room and be fitted with a shower bath and lavatory basin.

### Changing Rooms

All gymnasia must be provided with separate changing rooms and shower baths; duplicate changing rooms are required if both sexes use the same gymnasium. It is advantageous if the same changing rooms can be used for both gymnasium and playing fields. In many schemes it may be found convenient to provide changing rooms for each sex at opposite ends of the gymnasium; the rooms may form a small suite with the apparatus store, instructor's room and shower baths.

## SECONDARY SCHOOLS: GYMNASIA, CHANGING ROOMS, GAMES STORES

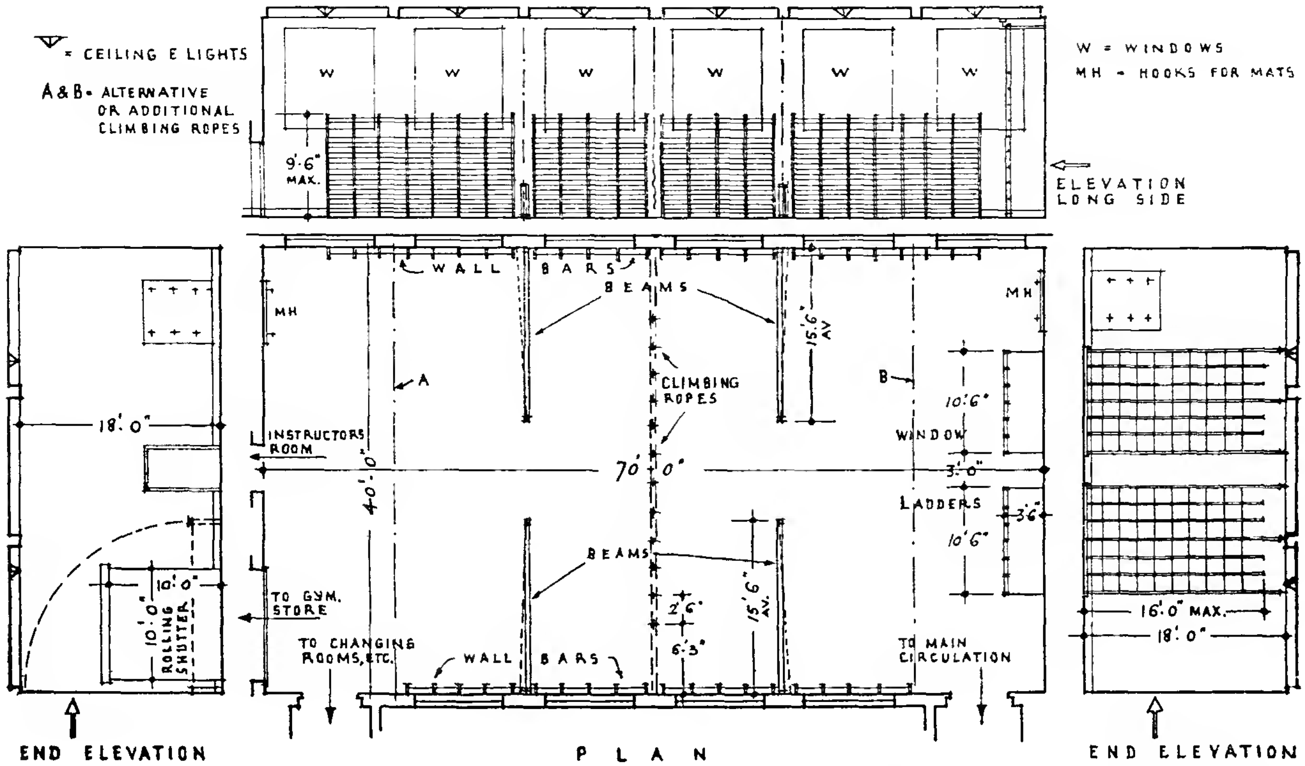
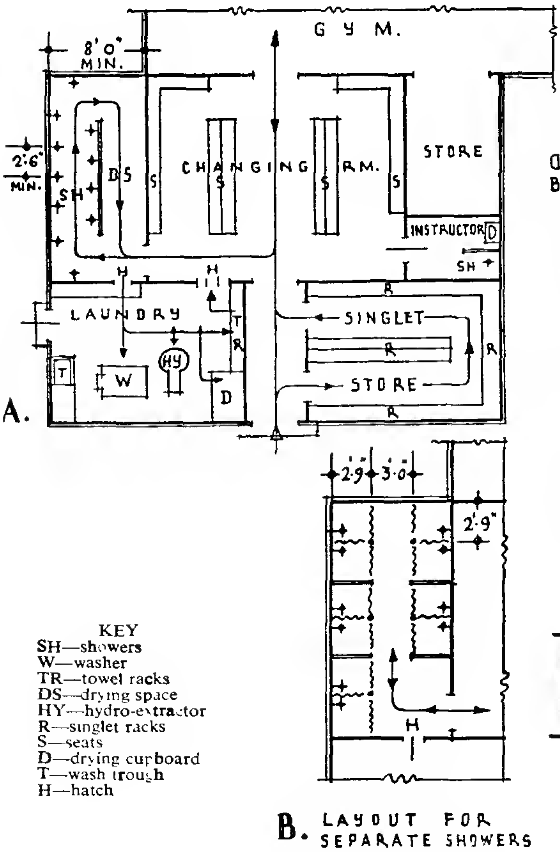
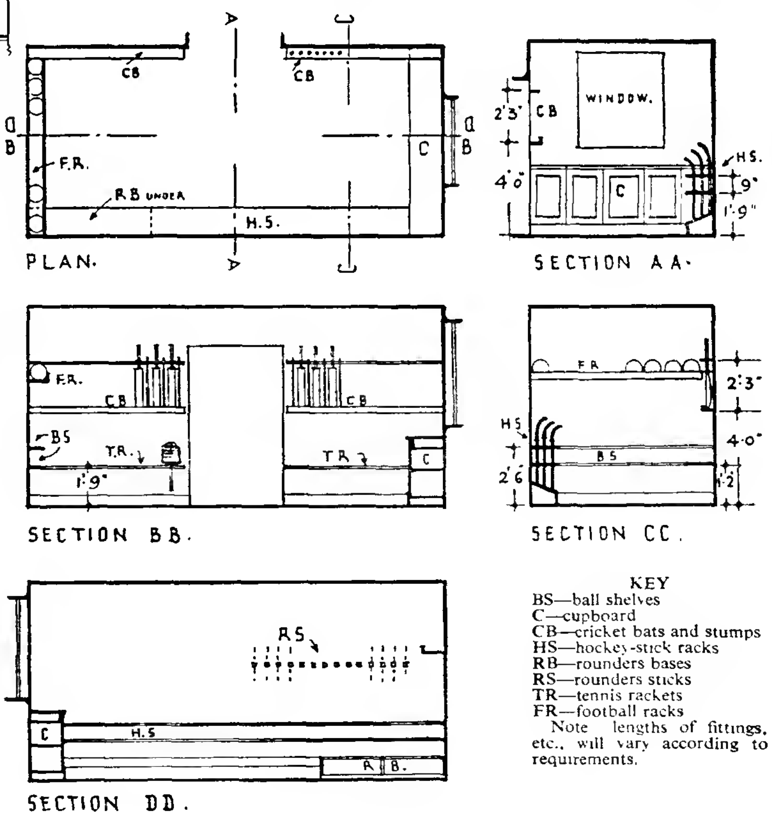



Fig. 50 Typical layout data for a gymnasium




KEY
SH—showers
W—washer
TR—towel racks
DS—drying space
HY—hydro-extractor
R—singlet racks
S—seats
D—drying cupboard
T—wash trough
H—hatch

Fig. 51 Changing rooms




KEY
BS—ball shelves
C—cupboard
CB—cricket bats and stumps
HS—hockey-stick racks
RB—rounders bases
RS—rounders sticks
TR—tennis rackets
FR—football racks
Note lengths of fittings, etc., will vary according to requirements.

Fig. 52 Games store

The actual changing room should have an area of not less than 400sq. ft.; the shower compartment should have an area of about 120sq. ft., subdivided into space for the showers and for drying. It is desirable that there is direct access into the changing rooms without entering the gymnasium itself, but direct access from the changing room to the gymnasium is necessary after pupils have changed, as is shown on Fig. 51. The shower-bath compartment should be so planned as to provide a continuous circulation. For boys' schools, and also for many girls' schools, the "run-through" type of shower bath, without partitions, is generally provided, but in some girls' schools, and occasionally in boys' schools, individual shower compartments are called for; these individual shower compartments may be formed either by curtains or by the use of fixed partitions. Shower outlet nozzles in the "run-through" type should be placed not less than 2ft. 6in. apart, and 3 ft. is usual; the width of the shower space is usually about 4ft. and the drying space should not be less than 4ft. and preferably much more. The wall dividing the showers from the drying space should be at least 6ft. high. A foot bath or trough is often installed at the approach to the range of showers; foot baths are often formed by placing large domestic deep sinks on the floor with seating arranged on each side. When partitions are adopted they should be based on running lengths of 3ft. and a front to back depth of at least 2ft. 9in., and better 3ft. The gangway space between individual showers, on either side of a room, should not be less than 3ft. and a greater width is desirable. For convenience of plumbing shower outlets are usually placed on the back walls of the partitions, but it is better where fixed divisions are used if the nozzle is placed on the division and is directed diagonally towards the back wall against which the floor channel is usually placed. When partitions are used the problem of keeping towels, etc., dry during use of the shower is somewhat difficult and numerous schemes have been devised of which the most satisfactory appears to be that in which the towel is placed behind a hinged flap hung on the division and closing across one corner of the compartment.

The flow of water may be controlled either by a master valve or individual controls; the former is usual for "run-through" types and the latter where partitions are used; both types, however, require efficient thermostatic control and mixing should be provided so that there is only one source of delivery with water at a controlled and agreed temperature.

Fig. 51 illustrates a typical changing room layout and stresses desirable circulation. Pupils enter the gymnasium block and pass into a clothing store, collect gym kit and proceed to the changing room. The changing room is usually equipped with clothes pegs and seats, under which are placed shoe racks generally similar to those used in cloakrooms, but the provision of at least one hanger per pupil is desirable in addition to pegs. On returning from the gymnasium, pupils enter the changing room, remove clothing and in passing to the shower room pick up a towel from the clean towel store; pupils then circulate through the shower and after drying towels are given up through a hatch before pupils re-enter the changing room. The materials of wall and floor finishes should be carefully selected for shower rooms to meet conditions of continual dampness.

The method of dealing with towels usually has a considerable bearing on the layout of the changing rooms and shower compartments. Undoubtedly the most satisfactory practice is to issue a clean towel to each child on entering the changing room or during passage from the changing room to the showers and to collect it for laundering after use. This avoids the necessity of storage and drying of individual towels for each pupil—a practice which requires considerable space if it is to be done adequately and hygienically. The alternative practice, whereby pupils bring their own towels to and from home, may involve carrying a wet towel in the pupil's satchel or bag for a large portion of the day, which would appear to be most unsatisfactory. If the first scheme suggested is adopted, a small laundry unit can be added conveniently, as shown in Fig. 51, to one of the changing rooms; the apparatus for such a room could normally be installed in an area of approximately 150sq. ft. It will be seen from Fig. 51 that the equipment necessary for such a laundry is relatively small. When towels are issued, or alternatively, if each pupil retains his own towel, storage is necessary for each pupil's shorts, singlet and gym shoes. This storage should be 1ft. 6in. high by 12in. wide and 12in. deep. The fittings should be only three-tiers high for younger children, but may be four-tiers high for older children. Back-to-back kit lockers should be planned at 6ft. centres. This storage may usually be provided conveniently in wire racks. It will be found that a floor area of approximately 300sq. ft. is needed to accommodate the kit of 300 pupils. Heating pipes are required below these wire racks. Very good ventilation is essential in changing rooms and shower compartments, but it is equally important to maintain a temperature of 55° F. in the coldest weather.

The instructor's room should be provided with a lavatory basin and an individual shower bath. It is desirable that some W.C. and/or urinal accommodation be provided in close proximity to the changing rooms and in the gymnasium blocks.

### Games Store

Adequate and properly fitted-up storage is needed for games equipment either at the school or at the playing fields. The amount and type of accommodation needed will vary greatly from school to school, according to the amount of interest given to organized games. Fig. 52 gives general details of the way in which suitable racks may be provided to meet the needs of different games. Cricket bats require a shelf with raised edge about 5in. wide, with a similar shelf fixed at 2ft. 3in. above it and perforated with holes at 4in. centres which should be 3in. diameter for bats and 2in. diameter for stumps. Cricket, hockey and similar balls can either be kept in cupboards or on racks; it is advantageous if the balls are raised off the shelves to permit of adequate air circulation by resting them on three-pointed supports. Footballs and netballs can be stored on shelves about 11in. wide with a high front edge; holes 2in. diameter and 10in. centres should be made in these shelves. Sticks for rounders may be held in wall clips spaced at 6in. centres. Hockey sticks require 3in. diameter holes spaced 4in. apart in a rack placed above a sloping base as shown in Fig. 52; a shelf 1ft. 2in. will accommodate three rows of sticks. Tennis

rackets require a shelf about 13in. wide with 2in. diameter holes placed at 3in. centres. All these shelves and fittings must be strongly made and very securely fixed to the walls. Cupboards are also needed for storage of cricket pads, gloves, score books and similar smaller articles.

### Staff Rooms

It is necessary to provide a staff common room in all schools, the minimum area of which should be 120sq. ft., but the area should be based on an allowance of 30sq. ft. for each member of the staff. If there is a considerable staff of both sexes separate rooms are sometimes asked for, but in any case separate cloakroom, washing and sanitary accommodation is necessary for each sex. The amount of sanitary equipment has already been given.

A special room of about 130sq. ft. for the head master or mistress is needed which should be centrally placed on the ground floor and planned in close proximity to the entrance used by visitors; a separate cloakroom and lavatory should be provided adjacent to the head teacher's room. Sometimes a small waiting-room is provided adjoining the head teacher's room, and in large schools an office for clerical assistants is also provided, and this should adjoin, but not be approached directly from the head teacher's room. An alternative arrangement is to provide a large room which will serve the dual purpose of a secretary's office and a stationery store room. In mixed schools, in addition to the head master's room, a room must be provided for the senior woman assistant who will have charge of the girls and may wish to interview them or their parents in privacy.

Rooms for senior assistants should be about the same area as those for head teachers, but the secretary's room may be reduced to about 100sq. ft.

Staff rooms should have a pleasant outlook and a sunny position where possible. Frequently staff rooms are placed in upper floors in a central position, and by such an arrangement it is often possible to provide a small suite of rooms in a quiet position for all but the head teacher's room. If school buildings are to be used for evening classes, a separate room is usually necessary for the teacher in charge of evening work. Some schools require a small kitchen adjoining the staff common room in which members of the staff may cook or heat food for use at time other than the midday meal when the school kitchen is in use.

Storage is needed for stationery supplies, craft materials and text books, which should be planned in association with the administrative rooms. Bulk storage is also needed for toilet and cleaning materials, in addition to the day-to-day supplies kept in cleaners' stores. A small workshop is needed for the caretaker.

### Room for Medical Officer

Provision must be made in all schools for a room to be used for medical inspection and treatment of pupils. In all large schools the room should be allocated entirely for these purposes. It is desirable that the special room, or any room used for the purpose, should be at least 140sq. ft. in area, although it is desirable to have one dimension of at least 21ft. for eye-testing. A small waiting-room in connection with the medical inspection room should be provided. The rooms to be used for this purpose must be equipped with a lavatory basin having hot and cold water and W.C. in close proximity, good lighting and heating are essential, and the room should be capable of being darkened.

### Special Schools

Schools which fall into this group vary considerably; some types are almost normal school buildings, whereas others can be said to be allied to hospital planning, to meet peculiar physical requirements of children with widely divergent mental or physical defects. The sizes of classes are to be as directed by the Ministry of Education, and may vary from 10 to 30, according to the nature of the disability of the pupils. For deaf and partially deaf children, classes are limited to a maximum of 10; for children who are blind, partially blind and for maladjusted children the maximum class should not exceed 15 pupils; for the educationally subnormal, epileptic or physically disabled, the maximum is 20 and for delicate children the maximum is 30. These maximum numbers are applicable to children of all school age groups.

Site and playground areas have already been referred to in this section and reference back will show the slightly different requirements needed. The Regulations regarding cloakrooms, changing rooms, sanitary apartments, storage provisions and kitchen accommodation are the same as for normal schools. The Third Schedule of the Regulations sets out the accommodation to be provided for different types of pupil and in general this does not vary greatly from normal schools except for areas required and for the types of rooms selected as suitable for the health of children in each particular group.

### Open-air Schools

For more delicate children "open-air" schools are sometimes built, but these should not be confused with "normal" schools constructed on "open-air" lines. Pupils in special types of open-air schools are those suffering from physical defects such as malnutrition, rickets and anaemia, while mentally defective children are sometimes accommodated in similar schools or in completely separate wings of the school. These schools usually provide for a small total number of pupils.

Sites should be chosen on the outskirts of towns but within easy reach of good means of transport, although in some areas transport arrangements are specially made for the collection and return of children to and from their homes; in any case, such a service is essential for those pupils whose disabilities are too great to use public means of transport. In such schools, playgrounds and school gardens are of great importance, and consequently a level site should be chosen with, or be planned with, a good wind-shield of trees on the north and east sides, and even on all sides if the site requires it; south-east or south aspect is essential. Dining-accommodation will generally need to provide for meals for the full 100 per cent of school numbers.

The schools frequently provide accommodation for both sexes. The main accommodation may be divided under four heads: teaching, physical training, resting and dining, but each is interrelated with the others and the different parts of the building, although separated must not be too independent of one another. Schools of this nature are usually of one storey only.

### Special Classrooms

The essential feature is to secure a maximum of light and air with facilities for protection from driving rain and cold winds. The size of classrooms should be not less than 480sq. ft., and some advantage has been found in the use of approximately square rooms. Classrooms may either be detached with four sides capable of being opened as shown in Type A in Fig. 53, or in a continuous range when two opposite sides only may be opened as in Type C of Fig. 53. The former type is perhaps the most satisfactory, but a variation in which two classrooms are put together as a unit, as shown in Fig. 53 B, may be found to be more economical; if the latter arrangement is adopted and the two rooms are divided by a movable partition the whole may be converted into one large room if required. Detached classrooms are not necessarily the most costly, as light construction may be used; the method involves, however, considerable lengths of covered way as weather protection; connecting links are one of the greatest difficulties in open-air-type plans as it seems impossible to design a waterproof open-sided covered way and, therefore, the children have to walk from room to room on wet paving. Fig. 53 D illustrates an alternative form of a continuous type arranged to permit two walls to be opened and at the same time to avoid opening the cold aspect side, as is necessary in Type C; the arrangement gives greater flexibility in encountering driving rain. All the sides of the classroom must be capable of being closed either by glazed doors or screens with hopper-type fanlights above to ensure cross-ventilation in all weathers. Floors should be lifted about 12in. above the ground level and there should also be low thresholds or breast-walls above the floor level to protect the feet from draught and cold.

The heating of such classrooms presents a problem about which opinions vary considerably; it is true that all the usual methods of heating only raise the temperature of the room a few degrees, but the main purpose of providing heating in an open-air classroom is to ensure a drier atmosphere and so that in damp weather the room may be closed up and dried. Separate slow-combustion stoves have proved the best and most economical method of heating these rooms.

### Rest Sheds

The provision of one or more rest sheds to accommodate all the pupils is essential for many categories of special schools; this provision may either take the form of a large space for the whole school or a series of spaces for groups or classes. The areas needed in rest sheds should provide at least 20sq. ft. per child. It should be borne in mind that the older children require rest beds of adult size, which is about 6ft. 6in. long by 2ft. wide. Rest sheds can usually be constructed as simple light structures; they can also serve the purpose of covered play space. Glazed screens are necessary to enclose the rest space during inclement weather, and much advantage can be derived from a wide projection to the roof so as to avoid the need to close the screens in wet weather during the period when the beds are in use; such an overhang needs to project 6ft. to 8ft. from the end of the front row of beds, according to the height of the roof above the floor. The floors of rest spaces should be raised at least one and preferably two steps above the surrounding ground. It is important that adjoining every rest shed there should be ample storage space for rest beds and blankets.

this storage space must be adequately heated and ventilated to ensure the dryness of the bedding. Fig. 54 illustrates a typical layout of a rest space, based on using the smaller size of bed, 4ft. 6in. long; main gangway spaces should not be less than 3ft. wide and beds should be at least 12in. apart. The figure shows the front row of beds in a fine-weather position under the overhang of the roof; these could not be used in wet weather. An access path at least 4ft. wide is desirable across the front of the rest space and should be of a hard material with a fall away from the shed itself.

### Medical Room

In schools for delicate or physically disabled pupils, a large medical room is essential, as some regular remedial treatment may be needed for a number of pupils; this accommodation is in two parts; firstly a medical inspection room, having an area of 200sq. ft., which is enlarged to 300sq. ft. in schools for delicate or disabled pupils; secondly, a physical training room, which takes the place of the gymnasium provided in schools for normal children; physical training rooms usually need an area of 1,500sq. ft. and must be well lighted and ventilated. The apparatus and equipment varies very much, according to the nature of the disabilities to be treated in each school.

### Sanitary Accommodation

Special care is required in the planning and fitting of sanitary accommodation, as the children spend the whole day at school and special emphasis is laid on personal hygiene. Ample accommodation is of great importance. It is general to provide shower baths where there are delicate pupils and slipper-baths for physically handicapped pupils.

As many of these schools provide for both sexes, except for young children, it is usually necessary to duplicate sanitary accommodation and in many schools it must be dispersed so as to be in close proximity to each room or section of the building; this applies especially if the children are physically handicapped; moreover, for some children provision may be needed for handling bedpans.

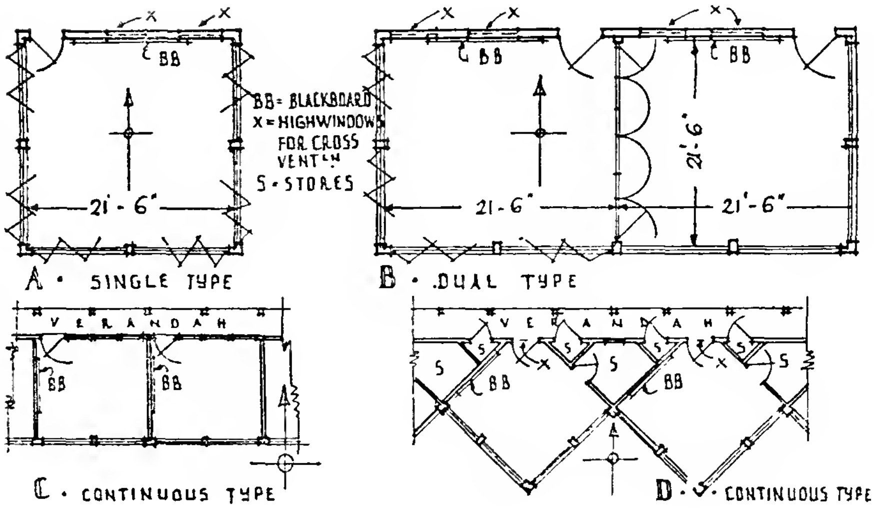



Fig. 53 Open-air classrooms

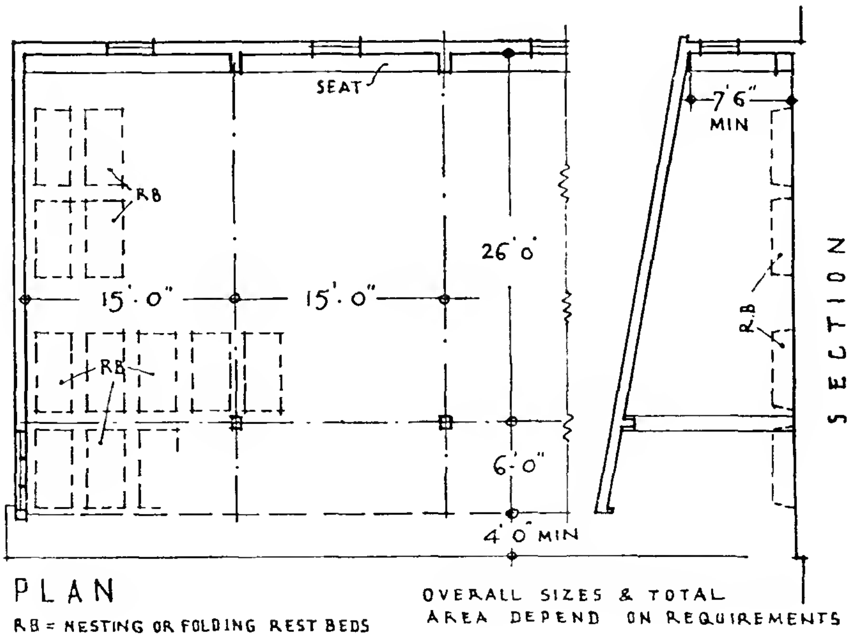



Fig. 54 Open-air rest sheds

### Boarding Schools

The new regulations set out, for the first time, the requirements for boarding accommodation in county, voluntary and special schools. Up to the passing of the 1944 Education Act very little, if any, boarding accommodation was provided in State-assisted schools, except in the case of remand homes and homes for orphans and similar special classes of children. Boarding schools are usually provided either by charitable organizations or as schools run privately as preparatory and public schools.

The Regulations do not give a lead as to whether boarding accommodation should be grouped with teaching accommodation, or whether the boarding accommodation should be separate. Practice has, in the past, varied very considerably; some schools have had part of the boarding accommodation attached to teaching buildings and in some cases the whole has been very closely related, whereas in other plans this accommodation has been arranged in separate "houses" either on the same site or on sites completely separated from that providing teaching buildings and playgrounds.

### Sites

The regulations require that where boarding accommodation is provided on the same site as the school, the area shall be increased by not less than half an acre for the first 50 boarders and by not less than an additional quarter-acre for every additional 50 boarders; where, however, boarding accommodation is provided on a separate site the area shall not be less than one acre for the first 50 boarders and shall be increased by not less than half an acre for every additional 50 boarders. It would appear that such site areas are not particularly generous and that in practice, in the past, it has been usual to provide greater areas. Even with such requirements the areas of sites are likely to amount to considerable totals, a fact which raises problems as to the relation of schools to towns and also the relation to the areas from which pupils are drawn; as no great daily demand needs to be placed on transport a site on the outskirts of a town would seem to be most suitable, although the selection should be made so that deliveries of supplies are not made difficult. Since pupils are likely to be drawn from a wide area the site should be near a town having a good transport system connecting easily with the area to be served. It would appear to be advantageous if a single site can be obtained which will be sufficient for the school, the boarding houses, the playing fields and for housing such of the staff as are not accommodated within the various school buildings themselves.

### General Layout

The layout must of necessity vary considerably according to whether or not boarding accommodation is attached to teaching rooms. When the two types of accommodation form one group of buildings it is not unusual to devote the ground floor to teaching rooms, dining facilities and common rooms, with one or more floors over used for sleeping accommodation for pupils, staff and domestic staff. Where the boarding accommodation is in separate buildings, the ground floor of these buildings is generally devoted to daytime requirements and the upper floors to sleeping accommodation. The method of providing meals has great bearing on the layout and the planning as a whole; this method may take the form of a central dining-room block in which the whole school may be accommodated, and which also provides for the day pupils' midday meal. Alternatively, the facilities for meals may be provided in each of the separate boarding houses. The central organization of dining-rooms would seem to be the most economical, but it most certainly calls for boarding houses to be in close proximity to the main school building. Such a method is, therefore, usual where boarding accommodation forms part of a single building, with teaching rooms, or where boarding houses are closely planned as in the types indicated on Fig. 55. Separate arrangements for meals are usually adopted when boarding houses are on a separate site or sites or are planned on the same site but at considerable distances from the main building.

Fig. 55 illustrates in diagrammatic form four basic types of boarding school plan based on the principle of placing the whole of the accommodation on one large site; an arrangement which seems to be the most satisfactory method for any complete scheme. There seems a possibility that some schemes may continue to be planned round the nucleus of an existing large house, although this can seldom provide a satisfactory scheme, as old buildings do not as a general rule lend themselves to the best plan arrangements.

Type A in Fig. 55 has a central administration building containing the assembly hall, dining-room and kitchen to which are attached the teaching rooms in two wings. Separated from the main block are the gymnasium and chapel, staff houses and the boarding houses. The boarding houses are grouped at the rear of the site in close relation to the dining-hall; the boarding accommodation is based on the use of a number of units quite separate from one another. Boarding houses in such schemes vary in size considerably, some in the past providing for as few as 30, whereas others have provided for as many as 100; an economical unit-size appears to be between 50 and 70 pupils, a number which is convenient for a house-master or mistress to control, with the help of junior staff.

Type B is based on the boarding houses being planned as a number of units, but closely related or even attached to the main part of the buildings; they are, in a sense, under the same roof and do not involve going out of doors to reach boarding accommodation. In this scheme the only really detached buildings are staff houses for married staff who are not housemasters, and staff such as porters, gardeners and the like.

Type C is somewhat similar to Type B, but the boarding houses are treated rather more as in Type A, being a number of quite separate units, but planned round a courtyard or "campus" and reached by covered ways or merely connecting paths. This scheme involves more roadway than that in Type A, but these roadways are kept away from the parts mostly used by the pupils and are at the backs of the houses; such a layout is likely to make for better and pleasanter grouping of the school buildings than Type A, and also at the same time is more open than Types B and D.

Type D is definitely based on the idea of one large building in which all the accommodation, both teaching and boarding, is approached from internal corridors; schemes such as this are usually designed to place teaching and all common rooms on the ground floor,

with the sleeping accommodation on one or more upper floors.

The diagrams indicate the main lines of road or traffic circulations needed for each type of plan, together with the main approaches.

It should be noted that chapels, gymnasia and swimming baths, also in many instances workshops, are usually treated as separate buildings, planned either as independent units or units attached by covered ways, thus permitting the cutting off of buildings needing to be quiet from those which are the source of noise. The placing of the boiler house and laundry (when provided) is usually dictated by the size of the school; in large schemes they are often planned as independent units, so sited that smoke is blown away by the prevailing wind. It is not unusual to find in large schemes a group of buildings comprising the boiler house, laundry, a covered swimming pool, so that the largest heat-users are placed near the source of heat. A small maintenance workshop is usually attached to the boiler house where staff can carry out running repairs; sometimes such a unit is allied to the pupils' workshops, especially in boys' schools. In smaller schemes, the boiler house is often placed near the kitchen, which is also a large consumer of heat.

## Main School Buildings

The main building usually contains the assembly hall, teaching rooms, and accommodation for the more important staff. The planning of the hall and the classrooms follows exactly that already outlined for day schools, except that there may need to be some changes in cloakroom accommodation, as will be discussed later. The hall should be planned, as in day schools, in good relation to main entrance, pupils' entrance and to classrooms.

## Entrances

There is generally a main entrance which leads directly to the assembly hall and to the administrative parts of the school; it should also give easy access to the head teacher's accommodation, unless this is provided for a married man and his family, when separate access is needed, although there must be an easy connection from the main part of the school to the head teacher's office or study. Separate entrances should be provided for pupils, leading directly to cloakrooms; these entrances should be closely related to the circulation from boarding houses to classrooms, especially when the houses are separated from the main school building. It is desirable that vehicles should be able to drive up to the main entrancc and to the head master's house entrance. The roadways previously referred to must give vehicular delivery access to boarding houses, the kitchen and boiler house.

## Dining-room

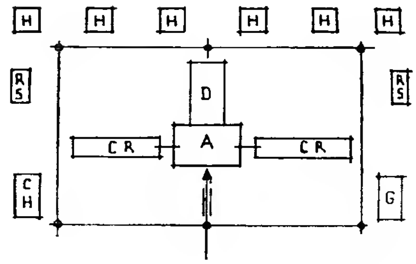
No specific requirements are laid down in the Regulations for these rooms or for the kitchens to serve them, but the information given in Appendix 3 of the Memorandum accompanying the Regulations is a useful guide. It should, however, be borne in mind that somewhat larger areas are desirable in boarding schools than for day schools, as all meals have to be provided instead of a single midday meal; this factor is of importance, especially with regard to staff accommodation and storage. It is also desirable that the floor area provide for all pupils to eat at one sitting, and that some if not all of the teaching staff should be present at some meals.

## Classrooms

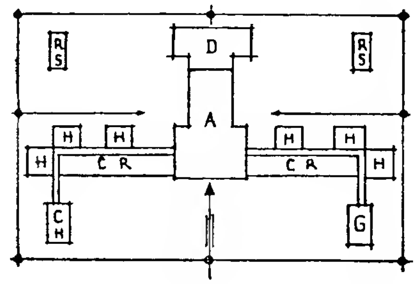
The requirements for these rooms are the same as for day schools, and therefore the information already given will apply equally. It is important, however, that classrooms and boarding accommodation should each be self-contained and not in any way intermingled.

## Library

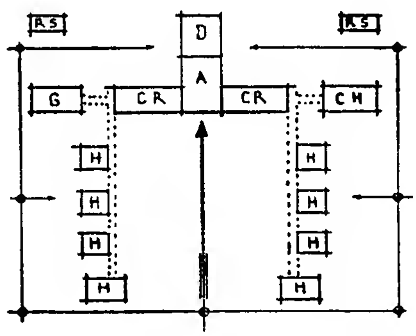
This room is likely to assume greater importance in boarding schools than in day schools and should therefore be more spacious than those provided for children who may have access to public libraries and books in their own homes. The library should be planned in closer association with the common rooms than with teaching



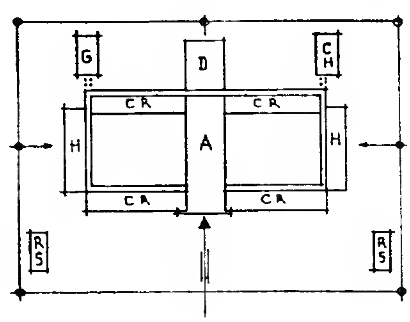

A Detached units




B Linked units




C Partially linked units (campus)




D Courtyard type

KEY
H—"houses"
CH—chapel
CR—classrooms
G—gymnasium
A—hall and general accommodation
RS—residential staff

Fig. 55 Type plans

rooms and should be treated as a room in which quiet is generally more possible than can normally be expected in common rooms.

### Gymnasium

This room is also similar to that required in day schools, excepting that in some circumstances it is possible to eliminate changing rooms and to rely on the changing rooms provided for other purposes, such as outdoor games; this can generally only be arranged where the boarding houses are planned to form part of the main school buildings.

### Cloakrooms

The amount of cloakroom accommodation to be provided is similar to that required for day schools, but its arrangement is dependent on the type of layout adopted for the school. If the boarding accommodation is separate from the school buildings and the central dining-hall, it is essential that the cloakrooms are near the entrances leading to the dining-hall, as pupils will frequently be coming to the main buildings for meals only and therefore a convenient position for leaving outdoor clothing is of importance in winter and inclement weather. If no central dining-hall is provided, and in buildings in which boarding and teaching accommodation are both approached from internal circulations, the cloakrooms should be near the pupils' entrance of the main buildings; in the latter case these cloakrooms may also serve as games changing rooms as discussed later.

### Sanitary Provisions

Basins and W.C.s should normally be linked with cloakrooms. The amount of equipment is generally similar to that needed for day schools, but rather more appliances are necessary, as both day and night use has to be allowed for, pupils being in the buildings continuously.

The Regulations give the following requirements for various types of appliance:

Baths (slipper): One for every 10 pupils—half may be showers.

Basins: One for every three pupils for the first 40, and for every four from 41 to 100, and one for every five thereafter.

W.C.s: One for every five pupils.

Urinals: One stall for every 20 boys up to 60 and one for every 40 thereafter.

Sanitary equipment must be distributed between day uses and the dormitories; although the amount required near sleeping accommodation is not great in regard to W.C.s, there is usually a comparatively large number of basins needed.

Some schools do not provide any baths for the pupils near the dormitories, but locate the whole complement together with cloakrooms and changing rooms, as pupils do not necessarily bath on going to bed or getting up in the morning; such an arrangement permits the full number to be available after games, when many require baths at the same time. If boarding houses are separate from the main school buildings it is probable that there will need to be some duplication of sanitary provisions, as the school will require the usual numbers of fittings provided for a day school and the boarding houses will need the accommodation mentioned above.

### Chapel

It is usual to provide a private chapel, often of a non-denominational character, to avoid pupils having to attend outside religious buildings during term-time. Seating must be provided for the whole of the school pupils, the teaching staff and for a number of visitors.

### Swimming Bath

In larger schools a swimming pool is often provided to avoid the necessity of pupils having to go distances to public baths; these baths are often of the covered type, and when not in use as a bath in the winter additional covered games or recreational space may be provided by temporarily flooring over the pool; this subject is fully discussed in the section on " Covered Swimming Baths "; the pool is often of a small size and the changing facilities of the simplest character.

### Staff Residences

It is often necessary to provide housing for members of the teaching staff, apart from those housed in the boarding houses, especially married masters, porters, groundsmen and engineers. These houses are usually grouped together on various parts of the site, but often having separate access to surrounding roads. The houses should be of normal types to suit the incomes of occupants, and should be provided with their own gardens. Unmarried staff, both teaching and domestic, are usually housed in the boarding houses although some of the former may wish to live out. A staff common room or rooms are usually provided in the main school building.

### Staff Garages

It is desirable to provide a group of lock-up garages for the use of resident teaching staff, and also facilities for the daytime parking of the cars of visiting teachers and medical staff. The garages should be sited in an unobtrusive but convenient position on the site.

### Provision for Games

As already suggested, it is desirable to provide playing field facilities on the site of the main buildings. A pavilion is usually required adjoining the most important pitches, and it should make provision for visiting teams to change, and in some cases for refreshment service of both school teams and their visitors. Provision is sometimes needed for further games, such as squash, rackets and fives and these may call for special buildings, which should be grouped and planned in an orderly manner, with due economy in respect of changing accommodation and the main circulations of the site.

### Boarding Accommodation

Fig. 56 shows in diagrammatic form an analysis of the boarding house planned as a separate unit attached to or wholly separate from teaching accommodation. The accommodation roughly divides itself into that used by day and that used for night, and this, in fact, also indicates the rooms which can be

planned on the ground floor, the remainder being planned on one or more upper floors.

The main entrance to a house block should provide access for visitors and staff and to the house-master's or mistress's rooms and to the matron's suite; a separate entrance is needed for the pupils, with their cloakrooms adjoining. Each house thus has to provide accommodation for three groups of persons, teaching staff, pupils and domestic staff, for whom the matron is generally responsible. The house-master's or house-mistress's accommodation may be merely a suite of rooms or a ground-floor study and first-floor bedroom with bathroom attached, or alternatively it may be a complete and somewhat cut-off house, if it is for a married man, although direct inter-communication is essential. Some accommodation may be needed for assistant staff, comprising studies, possibly a common room and bedrooms, or alternatively study-bedrooms and a common room, together with bathrooms and sanitary accommodation. Teaching staff bedrooms should not be less than 100sq. ft. and study-bedrooms not less than 120sq. ft.

The ground floor should provide pupils common rooms and study rooms and also the cloakroom and much of the sanitary provisions. The domestic staff, if housed in the boarding houses and not in a separate hostel, require a sitting-room and sanitary accommodation on the ground floor, to which must be added dining-rooms and kitchens if central dining-rooms are not provided. Domestic staff bedrooms are often provided on a separate upper floor from that occupied by teaching staff and pupils and should have their own sanitary requirements attached. The pupils' sleeping accommodation is usually provided on one or more upper floors; in many schools pupils are not allowed access to dormitories during daytime; thus the day and night accommodation are quite separately treated. Provision has to be made for storage of linen and clothing, together with sewing rooms for repairs.

### Common Rooms

The Regulations require the provision of common rooms for pupils on the basis of not less than 25sq. ft. per pupil, a requirement which is amplified in the

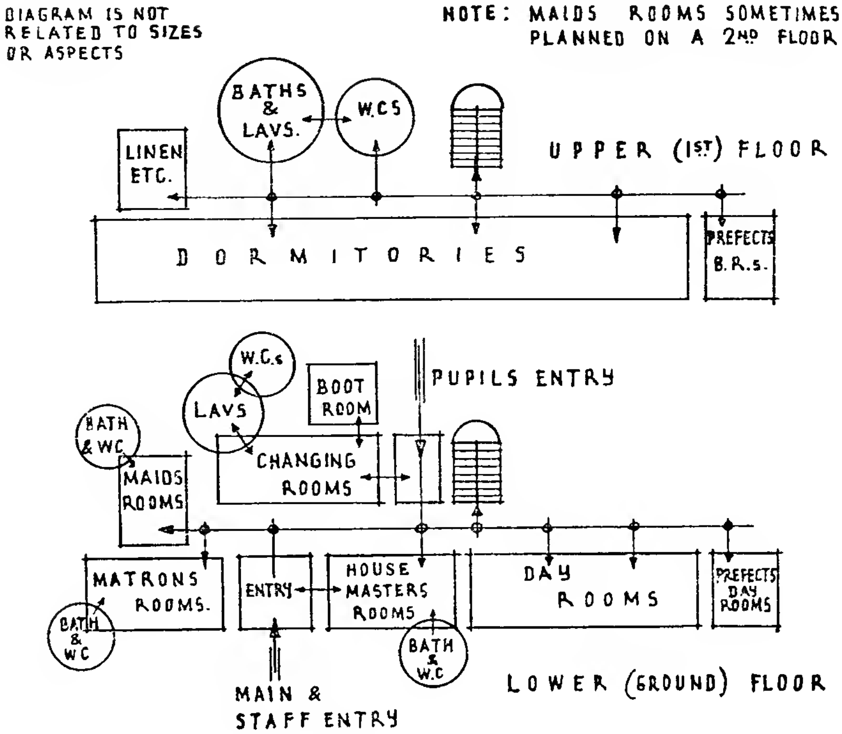



Fig. 56 Analysis of house planning

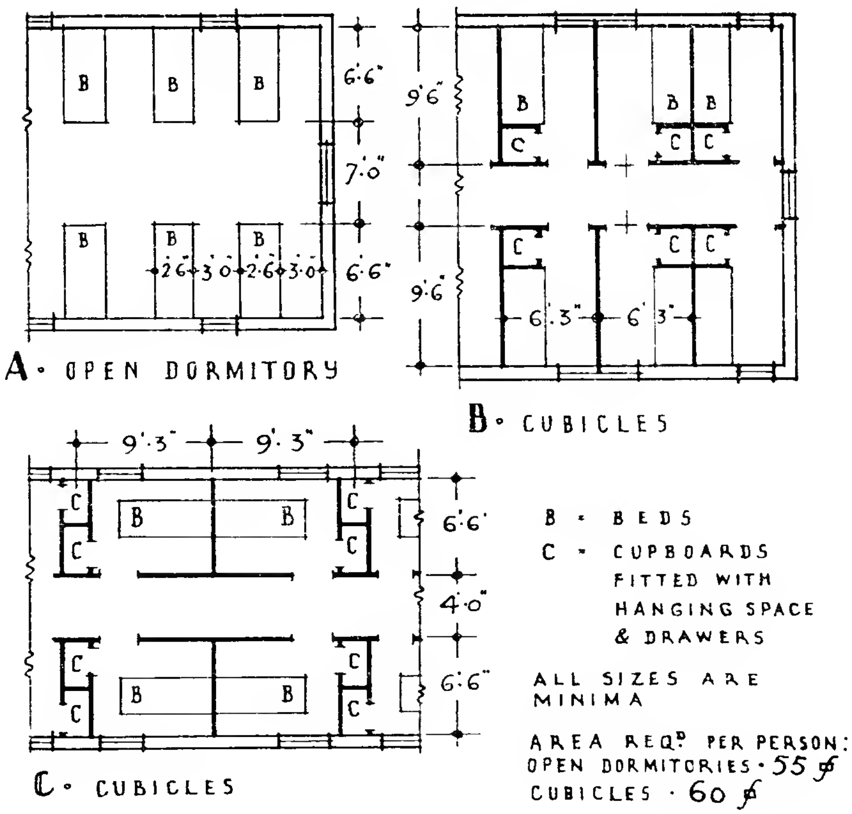



Fig. 57 Dormitories

Memorandum, which suggests that common rooms should not normally exceed 900sq. ft. in size; this seems to indicate that a number of common rooms will be required in most houses. Where boarding houses provide for both sexes, separate common rooms are required for each sex if the children are over 11 years of age, but for younger children joint common rooms are desirable. In any case separate common rooms should be provided for varying age groups within a school. Common rooms are best rectangular in shape, with windows on the long side. If prefects' common rooms are provided, as is desirable especially if individual study rooms are not provided, they should be based on 30sq. ft. for each pupil, with a minimum area of 120sq. ft. It is suggested that a quiet room or house library, separate from the common rooms, is desirable. A further recommendation in the Memorandum is that separate study rooms should be provided for the use of one or more pupils. It should be noted that the common-rooms requirements under the Regulations are very large, and if these are amplified by the addition of a number of separate rooms, a very considerable floor area is needed; it has been the general practice in many schools in the past not to provide common-room facilities for those pupils having single or separate studies, even when these are shared by as many as three pupils, but such an arrangement would not appear to comply with the requirements of the Regulations. In many schools individual lockers for storage of the pupils' personal property are provided in the common rooms, but in other schools separate locker rooms apart from, but adjoining the common rooms, are preferred; lockers should provide a space of at least 18in. by 12in. by 12in. deep per pupil.

### Study Rooms

The private study rooms, when provided, should be not less than 50sq. ft. in area for one pupil, 80sq. ft. for two, and 100sq. ft. for three pupils; these areas are dependent on the shape of the room and should be such that each pupil is provided with an adequate writing-surface having proper daylight. Each pupil requires a desk or writing-surface, a desk chair, some bookshelf and cupboard space and, if possible, an additional chair; consideration should be given to building-in of the furniture as far as possible as a means of economizing space. Each study should have its own window and heating facilities.

### Dormitories and Cubicles

Opinions as to whether dormitories or cubicles should be provided vary considerably; in boys' schools open dormitories are very usual for, at least, the junior pupils; in many girls' schools, however, the sleeping area is often divided by screens or curtains forming cubicles within a large room. Cubicles are almost always provided for girls over 12 years, but in the formation of these cubicles the divisions are generally wooden screens and the entrance side closed only by curtains. The floor area required in dormitories is not less than 55sq. ft. per pupil, with a requirement that there shall be not less than 3ft. between any two beds; where separate cubicles are provided each should have an area of at least 60sq. ft. Beds are usually 2ft. 6in. wide. Cubicles need individual windows. Good cross-ventilation and good light are essential in dormitories, and the tops of windows must be not more than 9in. below ceiling level. It is recommended that the number of pupils in a dormitory should be kept small and in any case not exceed 20 and for children under the age of seven, the number should not exceed six. Small dormitories are also desirable for children in special schools. The Memorandum suggests that a number of single bedrooms of not less than 80sq. ft. in area should be provided in the place of cubicles for the use of older boys and girls during the last year or two of their school life; such a provision tends to complicate considerably the planning of sleeping accommodation, since a number of similar rooms is necessary adjoining dormitories for the accommodation of supervisory staff. The method of providing for the storage of children's clothing varies greatly; for older children some drawer accommodation and some hanging space should be provided in each cubicle or adjoining each bed in dormitories, but for younger children it is usual to provide separate wardrobe rooms from which clothing is issued to the children, the control being in the hands of the staff.

Fig. 57 illustrates the spacing of typical dormitories and cubicles and the typical dimensions which arise from the minimum floor areas suggested; it will be noted that the dormitory as shown in Diagram A requires a span of 20ft., and if cubicles are arranged as in Diagram C the same width is needed if the gangway is 5ft., but this might be reduced to as little as 4ft. In the Type B the width of the cubicle cannot satisfactorily be reduced to less than 6ft. 3 in. if space for a chest of drawers is provided; the main objection to this layout is that the beds have to be placed with a long side against a wall or partition, which complicates bed-making. Type C requires a slightly less span but much greater length, but in order to keep the bed free on both sides and permit of a chest of drawers a greater width than 6ft. 6in. is desirable.

### Cloakrooms

In boarding houses the cloakroom often has to serve also as the changing room for games and has therefore to provide facilities for hanging outdoor clothing, storage of games clothing, and boot lockers. Many of the schemes adopted in the past have not been very satisfactory from the point of view of hygiene, as damp and frequently very dirty games clothing and even towels are stored in lockers. A better system appears to be the provision of a separate room for the outdoor clothing similar to that provided for day pupils, but based on the use of coat hangers, especially for girls, and another room for changing; adjacent is then planned proper storage and drying facilities for games clothing, and the bathing annexes. In some schools outdoor clothing is hung on pegs or hangers suspended from rods in a room or in corridors; boots and shoes are all kept in individual lockers in the boot room and games clothing in lockers round the walls of the changing room; these lockers should be at least 12in. by 12in. by 4ft. 6in. high, placed well above the floor to permit heating pipes to be placed below; they should be fitted with rods projecting from the back on which clothing may be hung separately, a towel rail and shelves at the base for boots and shoes. The boot room should be provided with some benching for

boot cleaning and it is desirable that a wash basin be provided. The main groups of lavatories and W.C.s should be planned in conjunction with the changing room and/or cloakroom, together with any foot and shower baths needed for changing purposes.

### Sanitary Accommodation

The number of appliances has already been given; it is necessary to disperse these appliances to meet all the needs of the school. W.C.s are needed in close proximity to the sleeping accommodation, but the numbers may be quite small and the bulk grouped together for day-time use. Washing facilities must be planned in close relation to the dormitories, but preferably in separate annexes; basins are needed at the rate of at least one to every four pupils in dormitories and groups of cubicles, and one in every single bedroom. Basins are usually arranged in ranges for boys and young children, but for all older girls it is desirable that each basin is placed in a separate cubicle 3ft. wide and about 6ft. deep to insure privacy. Adequate supplies of hot and cold water are essential for all slipper and shower baths and for basins; shower baths should be fitted with efficient mixing-valves. Good light, both day and artificial, together with good cross-ventilation, are most essential.

Separate sanitary accommodation should be provided for the staff, both teaching and domestic, in association with their bedrooms and their day accommodation. Domestic staff bedrooms should comprise single rooms not less than 100sq. ft. each.

### Storage

Ample storage rooms must be provided for linen and these are often placed on each floor level and may be connected to a sewing room on the ground floor by a hand-lift. These storage rooms must provide for airing of linen as well as storage of both clean and dirty articles. A large store is also required for luggage. Storage for cleaning materials and supplies should be distributed throughout the building.

### Means of Escape

Very great care should be taken in the planning of houses to insure easy means of circulation and especially adequate alternative means of escape in case of emergency. Staircases should follow the recommendations given for day schools and must be of fire-resisting construction, and corridor widths should be related to the amount of traffic at any point with a minimum width of 4ft. and better 5ft. for all normal purposes.

### Provision for illness

It is necessary to provide at least two single rooms in all boarding houses which may be effectively isolated for use in sickness.

For more serious illness it is necessary to provide a sanatorium when numbers exceed certain limits set out in the Regulations. Sanatoria have to provide wards for both infectious and non-infectious cases, and the total accommodation has to be for at least 10 per cent of the total number of boarders. These buildings should have wards, day-rooms and sanitary blocks, together with staff quarters for nursing and domestic staffs. The wards have to provide 120sq. ft. and 1,200cu. ft. per bed and beds must not be closer together than 6ft.

# Colleges for Further Education

## INTRODUCTION, SITES, ASPECT, CIRCULATION

### Introduction

Education is becoming increasingly wider and, under the 1944 Education Act, covers both general education of those over school age and vocational training for the more important trades, crafts, sciences and industrial processes. For the teaching of such varied subjects complex buildings differing greatly in both plan and equipment have to be provided; certain basic principles, however, can be found to govern the general planning of the more usual types, while the more specialized buildings only need to be provided in such districts where there is some special local requirement. Colleges or schools for further education draw their students from all types of junior schools and secondary schools, and provide full-time day courses, part-time courses and evening classes. In most towns and cities it is customary to group the teaching of allied subjects in one school whenever possible, even to the point of having a whole but separate building devoted to a group of similar subjects; for example, a school of building separated from a school of art or engineering school placed in a different part of the town. When, however, departments are small in number the departmental grouping is usually combined in one building, especially when departments can use certain rooms in common. Large educational areas may need several schools, each devoted to the teaching of a particular type of subject. In addition, however, a school may be provided for other subjects in lesser demand, in which case the teaching is grouped together. Such a general building should be so placed that access from all parts of the area is reasonably simple. Schools are sometimes separated on the basis of sex, more especially for the junior schools; but in many subjects sex divisions are quite impossible and although some subjects are almost entirely for one sex, opportunity and provision of accommodation may have to be made for the occasional student of the other sex. It should also be remembered that schools used mainly for one sex in the daytime may be required for both sexes for the purpose of evening classes.

The Ministry of Education's Building Bulletin No. 5 especially provides general guidance for the needs of these buildings, but it must be appreciated that the planning requirements vary considerably from building to building.

### Sites

Sites for buildings for further education usually have to be found in fairly heavily populated districts, as it is desirable to reduce the amount of travelling in which students, especially evening students, are involved. It is essential that there should be public transport facilities close to the site. The site area should provide ample space for car parking, and more particularly the housing of bicycles. Facilities for outdoor recreation are essential to a limited extent for junior technical schools and are desirable for all schools, while playing fields are greatly appreciated when site conditions will permit of their provision. The site area should allow of the use of single-storey buildings for workshops if it is at all possible, as multi-storied buildings for these uses are apt to cause undesirable vibration and noise which disturb study in adjoining rooms. The site area should allow for the possibility of some future extension, even if this involves additional floors over existing buildings. Back or side street access to the site is desirable to allow for deliveries of heavy machines, apparatus and materials by motor vehicles to workshops and laboratories, and for the supply of fuel and other requirements to the boiler-house and the refectory. When the service entry to the site has to be planned from the main street frontage, it should be so placed that it will cause the minimum inconvenience to the main entrance and the minimum disturbance to the quieter teaching rooms.

### Aspect

Certain rooms for particular purposes require special aspects and these requirements need some consideration at the time of site selection, as well as during all the planning stages. Workshops and laboratories usually need north or east light, art rooms north light, classrooms south or south-east light, especially in schools used for daytime courses. Isolation from noise, particularly noise from traffic in busy streets, is of the utmost importance for rooms such as lecture theatres and classrooms.

### Main Circulations

Fig. 1 illustrates diagrammatically the important relationships of the main parts of a typical building with the essential circulations. Near the entrance, which may be divided for staff, visitors and students of each sex, must be placed any car park space available, cycle storage and cloakrooms. Cloakrooms for students should be near the students' entrances when these are secondary or separated for each sex. Adjoining the main entrance should be the rooms necessary for administration, including offices and the principal's room. It is advantageous to have the staff common rooms similarly situated in order to be centralized in the scheme. Lavatories must be attached to the administrative accommodation and the staff rooms. When an assembly hall is provided, especially if it is to be used for public meetings or performances, care must be taken to comply with local regulations as to exits; the assembly hall should be placed in a position easily accessible from outside the buildings so that visitors do not have to pass near teaching rooms, but at the same time it must be readily accessible from all parts of the building used by the students. It is usual and desirable that the assembly hall be placed on the ground floor level.

The main teaching rooms may be divided into two types, namely, those for the sole use of one department, and those likely to be used at different times by several departments; the former should be grouped together to concentrate each department and have attached to them the necessary rooms for administration of the department such as the office for head of department, departmental offices and stores. The departments may usually be placed on any floor level except those involving workshops with machines, or which need heavy supplies; these are usually placed on the ground floor and often in single-storey buildings. General rooms such as classrooms and lecture theatres used by several departments are usually grouped together in some central position and may be on upper floors. A refectory is often provided and it is advantageous to plan this near the assembly hall and the main entrance; when there is a school of cookery the necessary rooms are often placed adjoining the refectory and its kitchens. The communal rooms such as students'

common rooms, library and gymnasium should be grouped together in a fairly central position. The students' common rooms and library often form a group near the entrance, but again may be on an upper floor.

A service entrance and yard is a very necessary provision; it should give easy access to all workshops and stores where heavy materials and machines are used. A service lift may have to be installed for deliveries to upper floor rooms.

The boiler-house and maintenance rooms and stores should be placed as centrally as possible in relation to the main demand for heat and power, in order to reduce the lengths of main services.

### Entrances

Entrances, as previously stated, may be planned in various ways. Many schemes have one main entrance used by everybody visiting the building, and such a scheme has the advantage of reducing supervision and control to a minimum. Other schemes separate the normal student entrances, whether there are one or more, from the main entrance which is used only by visitors, staff and students desiring access to the offices. Some schemes use the main entrance hall also as an exhibition hall, but this does not seem to be a very desirable feature, and it would appear better either to provide a separate and properly designed room for this purpose, or to use a wide corridor, say connecting the entrance hall to the remainder of the building or to the assembly hall.

Some schemes have separate entrances for each sex, leading by way of the cloakrooms to the teaching rooms, where both sexes meet again, unless the subjects taught are related mainly to students of one sex; other schemes, especially when the building is very large and has many departments, use two or more entrances giving access to certain departments only, which have the advantage of reducing, in such large buildings, the amount of walking and possible congestion due to large numbers of students using the main circulations.

At the main entrance there should be a porter's and general inquiry office controlling all persons entering and leaving the building.

### Administration

Adjoining the entrance hall must be placed the administrative offices, which vary in size in proportion to the numbers of the students. The general office is usually arranged with a long counter where all inquiries, excepting those which are purely departmental, are dealt with. Fees are paid at this office, and generally materials, stationery and books are also sold to the students. In addition to the general office, there is usually an office for the secretary, often with a waiting room, accountant's office, clerical staff offices and the principal's room; the last should have a waiting room attached. Many schemes need, in addition, a board or management committee room. Storage rooms for records, stationery, materials, books and other supplies should be grouped with the offices and be readily accessible from them. All planning of this office suite must provide for all inquiries to be dealt with at the general office in the first instance, and access to the principal and secretary must only be available after an interview at the main counter of the general office. Separate cloakroom and lavatory accommodation for both sexes is needed for the administrative staff and also attached to the committee or board room. The principal usually has lavatory accommodation adjoining his office. Since the general office frequently has to deal with large crowds within short periods, especially when it acts also as the book and material shop, very long counters are of the greatest importance, and it is desirable to have two doorways to the public space to avoid congestion and to keep students moving in one direction. These rooms call for little special planning as they are normal offices. The committee room which is used for meetings of various bodies, such as governors, board of studies and examiners, should be planned on the lines of a board room as discussed in the sections on " Municipal Buildings " and " Offices."

It is desirable that the assembly hall may be approached from the main entrance hall even if the hall has separate entrances directly from the street, as may be needed if it is planned to be let separately for public meetings or performances. If separate entrances are not provided, a position immediately in front of visitors entering the building is desirable for the assembly hall, so that visitors have no need to enter the corridors giving access to teaching rooms and intermingle with students and cause unnecessary congestion. A central position near the entrance often assists in isolating the hall from teaching rooms, which might be disturbed by users of the hall, and equally the workshops might interfere with the use of the hall.

Fig. 2 illustrates the main entrance of a scheme where one entrance only is provided to serve for all purposes including the assembly hall, but excepting the service approach. If the assembly hall is not planned in the position indicated it is desirable that the space be occupied by the main vertical circulation staircase and main corridor leading to teaching rooms and workshops, or it might be used for the exhibition hall. At the side of the actual entrance are placed the porter's office and telephone exchange, the latter forming part of the general office, although in some schools the porter also controls the telephone. The general office, with its counter space, adjoins the entrance hall and gives access to the waiting room, interview room, and principal's office. The committee room is placed on the opposite side of the entrance hall from the administrative offices.

Fig. 3 illustrates a larger scheme where two entrances are provided, each serving separate groups of departments. One group of administrative offices is common to both sets of departments and is consequently planned between the two entrances in order to be available equally to students of either group. The general office in this scheme has a counter set back from the main circulation corridor. Opposite the general office could be placed such rooms as might be needed jointly by students of all departments, such as the assembly hall, gymnasium, refectory or exhibition hall, or the space may be used for the remainder of the administrative offices necessary for a large institution. The offices for the secretary and principal are grouped with the general office to ensure control of all callers. A scheme such as this, with two entrances, requires a porter to control each approach. A first aid room is provided at the entrance to the technical departments, in which minor injuries may be attended to and in which the medical necessities may be stored for emergencies. The school

# Colleges for Further Education

## CIRCULATION, ADMINISTRATION

shop may, as already stated, form part of the general office, but in some schemes it is planned as a separate unit; considerable space is needed for this purpose in connection with certain subjects, or in schools where many and varied subjects are taught. The detail planning is entirely dependent on the subjects taught at each school, and the materials, instruments and books necessary in each case. Considerable storage space, preferably adjoining, or at least in very close proximity to the shop counter, is most important. Space for the display of some of the articles stocked and for books is desirable.

### Corridors

A satisfactory width for general corridors giving access to teaching rooms is 7ft.; this width may be reduced a little for short lengths of corridor to, say, 6ft. and it should be increased for important main corridors carrying much traffic. Lockers are often placed in corridors, as will be discussed in the paragraphs on cloakrooms, and when such an arrangement is adopted corridors should be increased in width by about 2ft. if lockers are placed on one side, and 4ft. when placed on both sides, to provide a normal walking width, and to allow space for the lockers as well as for the locker doors when open. It is better, however, to avoid placing lockers in corridors, also movable furniture such as seats, showcases or storage cupboards. If it is considered necessary to place cupboards or showcases in corridors it is wise to build what is equivalent to double walls between the corridor and the classrooms, and place built-in fittings in the thickness thus formed, which provides flush faces to both corridors and classrooms, while the doors to the fittings may open on whichever side is needed. *Cul-de-sac* corridors should be avoided and, when possible, long corridors, especially those with rooms on both sides, should be broken up with swing doors at intervals to reduce draught and noise. Long corridors should also have bays formed to provide natural light and ventilation. Good light and adequate ventilation are desirable for all corridors and consequently it is desirable to avoid continuous building on both sides.

When glazed showcases are introduced into corridor sides, the lower

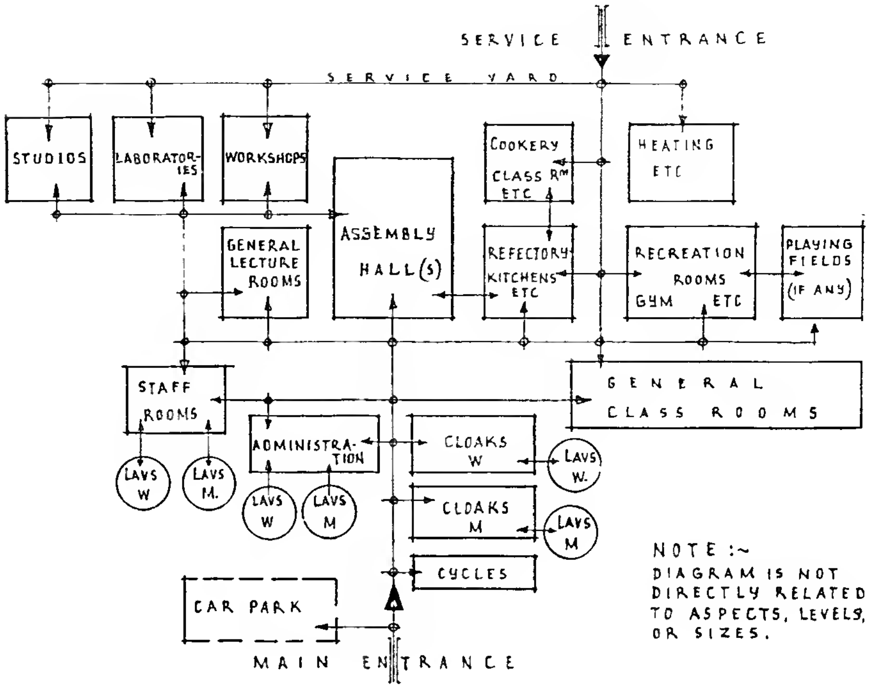



Fig. 1 Plan analysis of main units

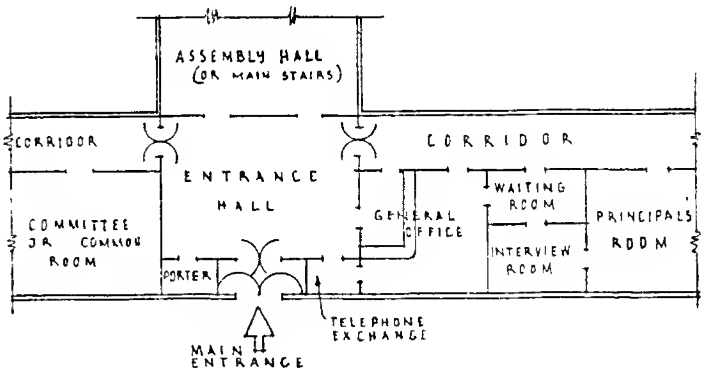



Fig. 2 The entrance and administration

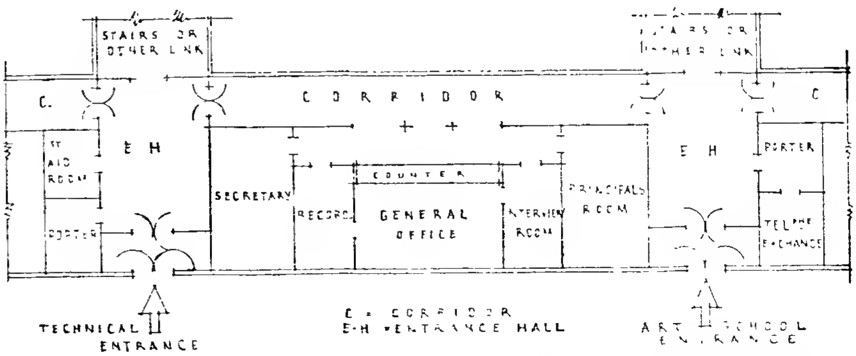



Fig. 3 Alternative entrance and administration

edge of the glass should be kept well clear of the floor to avoid risk of kicking; doors to display cases of this type must lock, and a depth greater than 18in. or 21in. is seldom needed. Display cases are of little value when more than about 6ft. above the floor, as the top shelf should not be above a normal eye-line and in junior technical schools the lower average height of students compared to that of adult or older students of senior schools should be borne in mind.

The finish of corridors should be carefully considered in relation to upkeep, more especially cleaning. Floors which have to be washed continually should be used only near entrances, and elsewhere they are better if finished with wood block, linoleum, rubber and similar materials which may be machine polished. Materials should be chosen to reduce noise to a minimum; they should be laid on a solid base and not on hollow surfaces such as boarding or joists.

### Staircases

At least two staircases are essential in all multi-storied buildings and at least one wall should be external so that daylight may be provided. Staircases must be of fire-resisting construction and should have a minimum width of 4ft., but widths over 6ft. are generally unnecessary. Treads should be from 11in. to 13in. wide and risers 5½in. to 6in. high; all winders should be avoided. Continuous handrails are desirable placed on both sides of staircases. Short flights of only a few steps should be avoided, as they are apt to be dangerous. Room or corridor doors should be planned away from top steps of flights and from positions near landings. Doors to teaching rooms should, if possible, be placed not more than 120ft. from a staircase. External escape staircases should be avoided whenever possible.

### Cloakrooms

In large institutions cloakrooms present a very difficult problem, especially in those having large numbers of evening students in addition to day students. The perfect solution does not seem to have been found; each scheme must be treated on its own merits in relation to numbers of students of each type, and to some extent depends on the subjects taught. The storage of books, materials, tools and instruments has to be considered in addition to clothing. Individual lockers are desirable, and almost essential, for day students, and are needed for at least a proportion of evening students. Lockers are costly and occupy considerable space; lockers for 500 students need at least 1,500sq. ft., and if changing space is also required a great increase in floor area is essential. Dimensions and spacing of lockers in rooms is given in the section on "Factory Buildings." As already mentioned, lockers should be avoided in corridors. Book lockers, as apart from cloak lockers, are detailed in the section on "Schools." Lockers are usually 12in. square and 6ft. high, and, therefore, it is necessary to allow 3sq. ft. to 4sq. ft. of floor space per person, but if the locker room is to be used also as a changing room an area of 6sq. ft. or 7sq. ft. is needed to allow space for seats. Lockers should be heated and ventilation to locker rooms should be considered carefully.

In institutions where the number of students is very large, particularly in regard to evening students, it is usually impossible to provide individual lockers for all students and, although a number should be available, some form of cloak accommodation must be provided; the latter provision may be made in various ways, such as in central cloakrooms either controlled or open, in small cloakrooms attached to each department, or by means of cupboards or large lockers in teaching rooms or workshops. Central cloakrooms have several faults which are difficult to overcome; if not properly and continuously supervised, losses are apt to be considerable and if controlled by attendants, the service is liable to be too slow to handle the clothing of large numbers of students in very short periods before and after teaching sessions. In either controlled or uncontrolled general cloakrooms numbered hat and coat pegs should be provided and require to be spaced as detailed in the sections on "Factory Buildings" and "Schools." Pegs should be spaced 12in. apart in single tiers and it is usually unnecessary to provide seats or shoe lockers, except if they are to be used by day students. As in locker rooms, general cloakrooms should be heated and very well ventilated. For evening students, in order that they may supervise their own clothing and deposit or obtain it quickly, it is often considered better to provide accommodation in the actual teaching rooms, and for this purpose rows of clothes pegs are placed in the rooms themselves; this scheme has an untidy appearance and if the clothes are wet is apt to be unpleasant. To overcome the difficulty of hanging the clothes in the room itself cupboards may be provided in which the clothes are placed, but it is desirable that these cupboards be heated and ventilated. Consequently, the scheme indicated in Fig. 4 has been used; this arrangement places the clothes in a series of cupboards formed in the thickness of double corridor partitions, which may be heated and ventilated. Ventilation is arranged by drawing the air from the classrooms through the cupboards into ducts placed over the corridor, where less height than in the classrooms is needed. Borrowed light for the corridor may still be arranged as indicated in Fig. 4. If the cupboards are constructed in units of 4ft. 6in. or 5ft., with pairs of doors along the full length of the corridor wall (except where the room door is placed), those not required for clothes storage may be used for general storage of materials needed for teaching purposes. The placing of individual lockers in teaching rooms is only possible when the rooms are used almost entirely by the same set of students, otherwise interruptions are liable to occur because of students needing access to their lockers. In large institutions it seems more satisfactory to place groups of locker rooms near each department for the use of students of the department only; by this arrangement each room is smaller and may often be planned in a position of little value for teaching purposes.

### Lavatories

It is desirable in large buildings to distribute the sanitary accommodation in various parts of the building rather than to assemble it all in one position. The main group should be near the cloakrooms, especially when there are general cloakrooms serving the whole building. Small groups may also be attached to each department, that is, situated away from any main lavatory accommodation. Workshops in particular should have some lavatory accommodation attached to them. It should,

however, be borne in mind that costs are likely to be increased when sanitary accommodation is spread about the building. It is usual to place lavatory basins in a room separate from W.C.s and urinals, although the compartments should generally adjoin one another to simplify plumbing and services as much as possible. Separate lavatory basin facilities for workshops are essential, even if W.C.s or urinals are not possible. Hot-water supplies are essential for all wash basins.

Basins should be provided at the rate of three for every five W.C.s or urinals; these numbers are for general use; if there are workshops, the basins provided in that section of the building should be additional.

W.C.s should be provided at the rate of six for the first 100 students, regardless of sex, with five additional fittings for every additional 100 students. Two-thirds of the fittings for male students may be urinals. Numbers should be based on the maximum number of students likely to be in attendance at any one period. The assembly hall should have separate lavatory and W.C. provisions for both sexes for the public, and also attached to any dressing rooms which may be provided. Lavatory and W.C. accommodation for each sex should be attached to both teaching and clerical staff rooms and offices.

Drinking fountains should be provided in all lavatory rooms, the vertical jet-type being the best. All sanitary accommodation must be so placed that daylight and ample ventilation is available; it may be found desirable to assist the ventilation by mechanical means. Detailed planning information regarding spacing and arrangement of basins, W.C.s and urinals is given in Part 1: Sanitation.

### Staff Rooms

A staff common room is essential in all schools, and where there are teachers of both sexes a separate room should be provided for the women teachers. The rooms should provide about 30sq. ft. of floor space per head of the maximum number of staff likely to be in the building at any time. Staff cloakrooms and lavatories should be adjacent to the common rooms, although it is not usual to plan them leading directly out of the common

Fig. 4 Cloaks cupboards

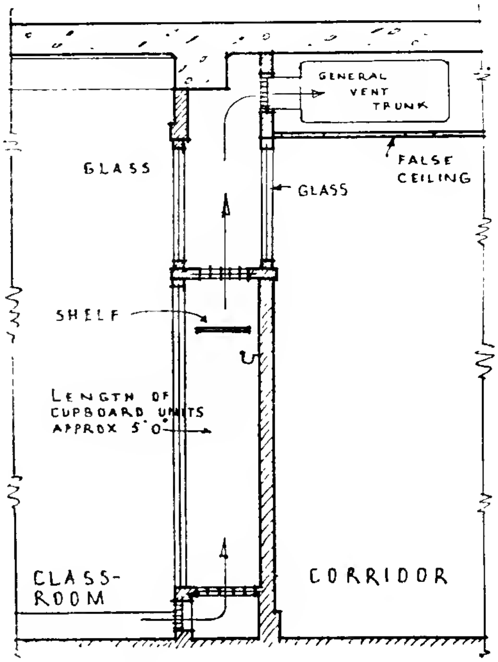
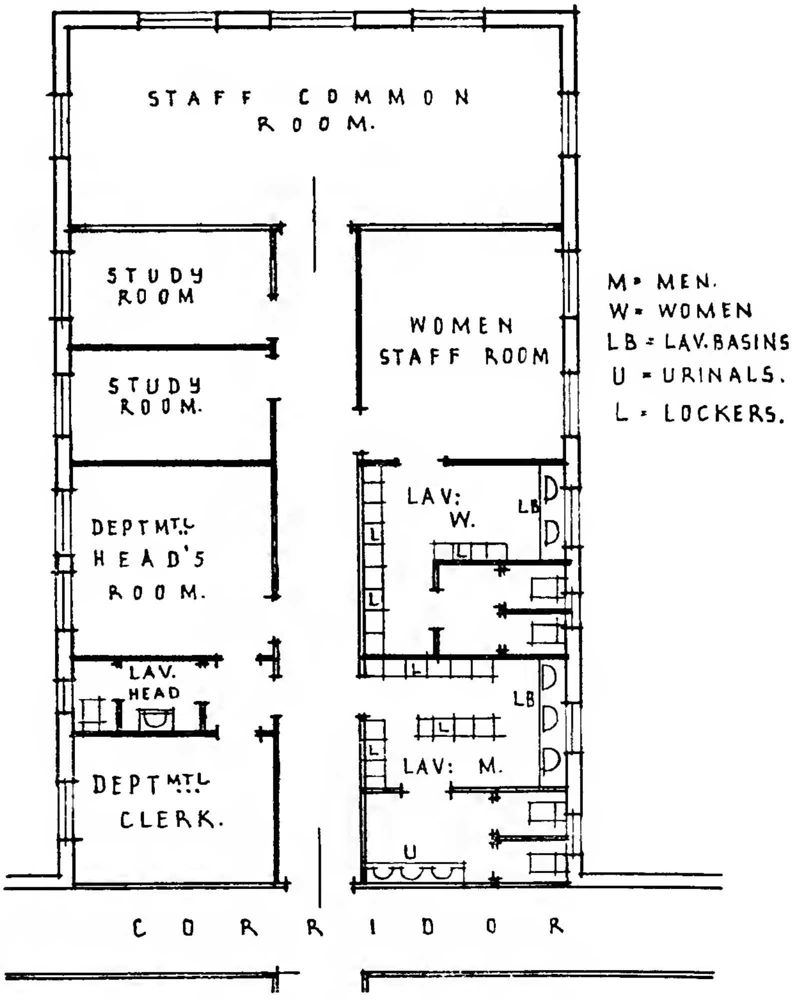



Fig. 5 Staff rooms



rooms. W.C.s and/or urinals should be provided at the rate of three for the first 20 members of the staff and one additional fitting for each additional 15 members. In some institutions a number of small study rooms are provided for the use of staff wishing to work quietly; these rooms need a floor area of 80sq. ft. or 100sq. ft. with good daylight. Rooms may also be needed for heads of departments: these may either be grouped together near the staff common rooms or, alternatively, may be placed with their own departmental teaching accommodation. Rooms for departmental heads need an area of about 150sq. ft. Many larger departments carry out a part of their own administration and require space for a secretary or clerk to the head of the department: a room consequently may have to be provided for this purpose. Such a room should have an area of about 100sq. ft. to allow for working space and some filing space and should be planned adjoining the room for the departmental head, preferably in such a manner that it may control access to the head's room, as there are likely to be many visitors such as prospective students and their parents. Such rooms or their approach lobbies are convenient for use as waiting rooms for those wishing to see the departmental head. A small lavatory with a W.C. is an asset attached to rooms for heads of departments; if this cannot be provided, a basin is often installed in a recess which may be used for hanging cloaks. Fig. 5 illustrates a typical staff room suite providing a general staff room used mainly by the male teachers with a small room adjoining for the use of the women teachers. A cloakroom and lavatory is provided opening directly out of the women's room and another lavatory and cloakroom is provided adjoining the women's lavatory for the male staff, thus the main plumbing is well grouped together. On the opposite side of the corridor are placed two rooms for the head of a department and his clerk, with a private lavatory attached to the former. The remainder of the suite is two small study rooms for the use of ordinary members of the staff. Lockers should be provided for the clothing of members of the staff; these are best placed in the lavatory which thus serves also as a cloakroom, as is the case in the example on Fig. 5. Lockers for the storage of the books and papers of the members other than departmental heads, or those with private rooms, should also be provided and these are often placed in the common rooms themselves but should be arranged so as to cause minimum discomfort to members in what is in fact a rest room.

### Rooms for Non-teaching Staff

Attached to all the larger technical institutions is a considerable number of staff apart from actual teachers; this staff includes porters, laboratory assistants, cleaners and engineers, whose attendance hours are often spread over long periods with intermittent breaks: and consequently a room must be provided for them which is often in the nature of a canteen where food may be obtained or where simple facilities are provided for heating up food, making tea, etc. The room should provide a floor area of about 12sq. ft. to 15sq. ft. per head of the maximum number of staff likely to be in the building at any one time. The cloakroom and lavatories needed for the staff of this type, which may be of both sexes, may with advantage be placed adjoining the canteen. If food service is to be provided it is essential that the canteen be planned within easy access of the kitchen used in conjunction with the refectory. These rooms are often placed in basements, but reasonably good daylight should be available.

### Common Rooms

It is desirable to provide common rooms for the use of staff and students. The importance of providing suitable rooms for use as students' common rooms has frequently been overlooked in the past but should be regarded as essential. It is, of course, impossible and even unnecessary to provide rooms large enough to seat all the students of the institution, but the greater the area the more they are likely to be used. These rooms may with advantage be grouped with the refectory and the library so that all the common rooms to be used by students of all departments form one group. The accommodation desirable is a large room, which may need to be 900sq. ft. to 1,000sq. ft. in area, for general use, a smaller room for reading and writing, a room of about 350sq. ft. for women students which should act as a retiring room, and one or more small rooms suitable for club meetings or for the use of an individual club or society. If circumstances permit, a games room is very useful.

It is desirable that these rooms have good daylight and, whenever possible, a southerly aspect.

### Assembly Halls

These may be used for various purposes, and it is probable that from time to time public lectures and performances may be given. As already pointed out, the hall should be in such a position that the public and all visitors to the functions particularly connected with the school do not disturb the normal working of the remainder of the building. It is, therefore, desirable that the hall should be near the main entrance and, if it is to be used frequently by the public, separate external approaches are an advantage. When the public is to have access to the hall it is necessary to plan entrances, exits, staircases, seating, etc., to conform with local regulations controlling buildings for public entertainment; this is specially important if a cinematograph, which is becoming a general provision in buildings of this type, is to be installed. The projection box must have proper cut-offs and alternative means of escape for the operators. (*See* section " Community Centres.")

In small institutions, where a large room to be used solely as an assembly hall is uneconomic, a suitable space should be provided by using two or more adjoining classrooms divided by folding partitions. Assembly halls are sometimes used also as dining halls, although such a dual purpose has definite disadvantages, since each normal use is likely to be interrupted frequently.

The sizes of assembly halls for normal uses should be calculated to provide at least 8sq. ft. of floor space per person, including the necessary gangways, or, for examinations, of 20sq. ft. per person.

It is usually impossible, nor is it necessary, to provide seating for all students in these colleges; allowance should be made for about 45 per cent of the students in smaller colleges to about 20 per cent in very large colleges.

In some institutions the assembly hall serves also as the gymnasium, but such

an arrangement is very undesirable, and detrimental to the proper uses of either a hall or a gymnasium.

The hall should be so placed that all teaching rooms are isolated from it as much as possible; good daylight is desirable, especially if the hall serves for examination purposes.

The planning of a hall on the street frontage makes possible direct public access without entering the school, but a more central position in the plan is usually more advantageous for other reasons; also, it seems much better to place the hall centrally in the group of buildings rather than at one end, so that it is equally accessible to all parts of the school. The hall should not be used as a passage way for access to any other parts of the school building. Approaches, and, if possible, exits, should be under cover. Ceilings are best if flat and not more than 30ft. above floors. The notes regarding sections in assembly halls for other types of schools given in the section on "Schools," apply equally to technical schools. Acoustics must be considered carefully when deciding the plan and section shapes. To provide additional seating balconies are often introduced, and easy approach from the hall entrance up to the balcony is very important. The figure given in the section on "Schools" concerning the linking up of a number of the larger units of the plan such as the dining hall and gymnasium, is worthy of consideration for technical colleges. Floors in halls of this type should be flat without falls towards the stage, because of the uses of the hall other than in conjunction with the stage, such as school socials, examinations and special exhibitions. Wood block floors are usual with a wood dado on the lower part of the walls, while hard plaster on walls should be avoided to assist acoustics.

Fig. 6 illustrates certain points of planning (more especially in connection with circulations) in relation to assembly halls. Diagram A shows a plan and section of an assembly hall two storeys in height, where daylight from side windows is considered necessary; consequently, the corridors are planned on the long sides of the hall on the lower or main hall floor level only, and circulations on the upper level are available only at the ends of the hall and at one end include access to the balcony within the hall itself. Further storeys over the hall may be added to this type of plan if sufficient light is available from the side windows without the addition of top light.

In passing it should be noted that if these halls are to be used in daylight for certain purposes such as stage performances, darkness is needed; side lights are easier to fit with blinds than top lights

However, the main uses of this type are likely to be after dark as a general rule, excepting cinematograph and lantern lectures for day students.

Diagram B shows a further plan and section in which side light is available on one side of the hall only, the other side being needed for approach corridors at each floor level. If the upper storey is not required corridors may be placed on both sides and the hall lighted entirely from the roof. It is usually difficult to provide adequate light for such purposes as examinations from one side only of wide halls, even with windows placed at a very high level. A plan of this type does, however, permit of direct exit to the open air, and not into corridors to other parts of the building.

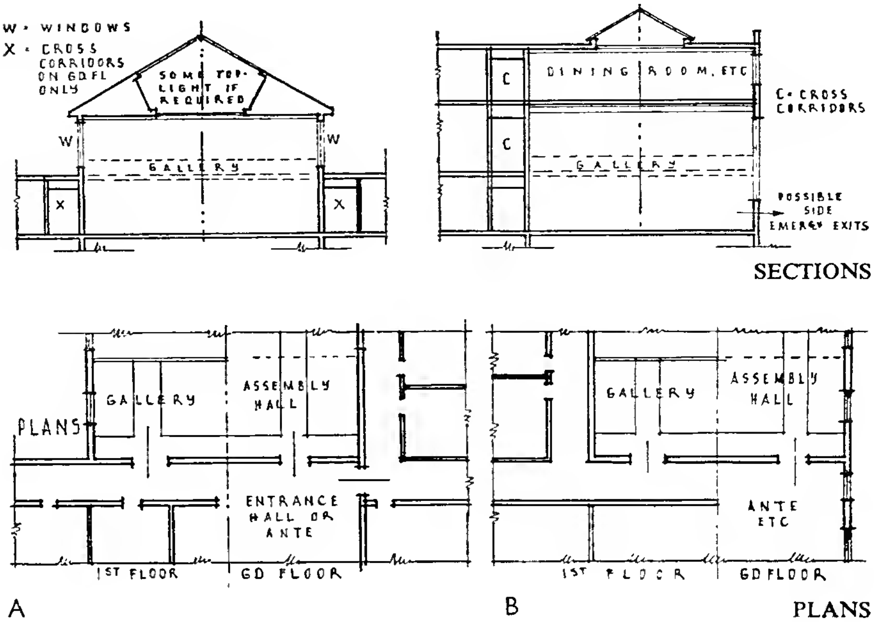



Fig. 6 The Assembly Hall

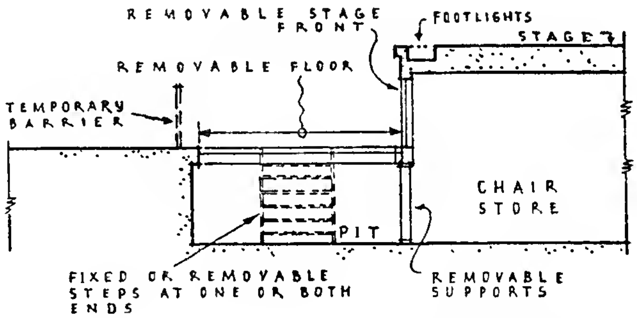



Fig. 7 The stage front

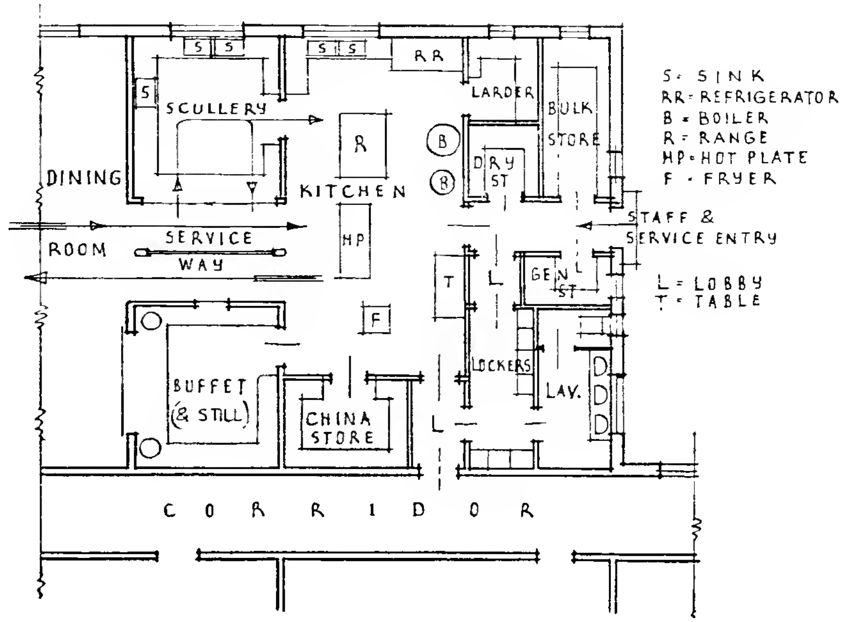



Fig. 8 Refectory kitchen

### Platform

The platform area must provide space for small orchestral or theatrical performances; the latter necessitates space for rear exits behind the actual stage, and 20ft. should be considered as a minimum depth behind the proscenium. A fixed proscenium is not necessary, but may be considered desirable in some schemes. Stage heights depend on the size of the hall, but 3ft. 6in. is a fairly usual height above the main floor level. A simple but efficient stage lighting system is essential, with ceiling battens and flood or spot lights, and footlights on hinged flaps to close away into the floor when not in use. Chair storage may be provided conveniently under the stage, but a height of 6ft. 6in. in the clear should be arranged. Access is obtainable through the riser of the stage front, but it is better to have 6ft. or 8ft. of the main floor removable to give access to the under stage level; this sinking may also be useful as an orchestra pit in conjunction with stage performances.

Fig. 7 illustrates this suggestion, and shows how the orchestra pit may be formed for the full width of the stage except for any necessary width required for access to the stage. The portion of the main floor normally covering this area is made in sections for quick removal, part of the stage front is also made removable, and a temporary barrier or orchestra front is needed, together with a temporary extra portion to close the opening between the bottom of the normal stage front and the floor of the pit. Steps are better if kept at the ends of the pit, where they may be permanent and serve for access to the orchestra pit as well as for handling chairs, etc., for the store.

At least one dressing room for each sex should be provided, with cloakroom and lavatory accommodation adjoining or even approached directly out of the dressing rooms. These rooms must be very close to the stage, and should have an area of at least 200sq. ft., and preferably rather more. It is desirable that they should be at the same level as the stage.

If the hall is to be used by the public, cloakrooms and lavatories for each sex should be provided near the entrance to the hall. In many schemes it may be found possible to plan the general cloakrooms of the school in such a position that they may serve also the hall. Information regarding the layout of seating and the requirements of corridors, staircases and exit doorways is given in various sections, and applies in general to halls of this type, which need to be planned to conform to the usual requirements of places of public entertainment.

### Dining Hall

In the majority of buildings of this type facilities for the service of meals have to be provided, as the students are likely to be drawn from a large area and consequently are unable to reach home for their meals. Schools providing evening classes in addition to day tuition often find that many students prefer to come directly from their employment to the school without going home and, therefore, like to be able to obtain some refreshment before the evening session commences. The meals to be served are usually of a simple nature which do not require very elaborate kitchen equipment and much of the service, except luncheon for the day students, is of the light refreshment type. Some institutions cater on the self-service lines and others with waitress service; a combination of both types may be an advantage in schemes dealing with both day and evening classes. The floor area to be provided should be calculated on the basis of 8sq. ft. to 10sq. ft. per person on the maximum number likely to be served at any time; these areas are based on the use of fairly large tables seating at least eight or ten persons, as small tables for four require rather greater space for comfortable service circulation.

The dining hall should be placed in a position easily reached from all parts of the building, as it is likely to be required by staff and students of all departments. There is no objection to planning the room on an upper floor with other communal rooms, such as common rooms. If an upper floor position is chosen, the kitchen should be on the same level and, therefore, a service lift must be installed for handling tradesmen's deliveries. An upper floor has the advantage that the kitchens may be ventilated easily without cooking smells penetrating to the remainder of the building. If, as already stated, there is a school of cookery included in the curriculum, it should be planned adjoining the dining hall and kitchens and, if possible, on the same level or immediately above or below. Students in the cookery school may then be trained in part by the practical preparation of meals for the dining hall and the same services may also be used.

Wood floors are the most pleasant for dining halls, although linoleum may be preferred in some schemes.

Kitchens, sculleries, etc., are better with solid floors or tile or terrazzo, but again linoleum on cement screed may be preferred. Walls of kitchens should have a high tile dado. Dining halls frequently have a wood panelled dado. The rooms should be well lighted both by night and day, while good cross-ventilation is essential.

The kitchen rooms should provide for the actual cooking, a scullery or scullery recess, larder, store rooms, cloakroom and lavatory for kitchen staff and in large institutions, a small office for the manager; also a kitchen staff mess and rest room. The food from the kitchen should be handled through a servery. The area needed for the kitchen and ancillary rooms will vary from a quarter to one half of the dining hall floor area, and a figure near the latter should be generally assumed. Proper sequence of circulation through the kitchens and layout of equipment is very important. Fig. 8 illustrates a typical layout for the kitchens for a school refectory. The service rooms are here placed on the long axis of the room, but whenever possible are better placed on the short axis of the room. The circulation enters past the wash-up, where dirty crockery or glass is deposited, and certain clean articles are collected from racks. The waitress then proceeds to the hot-plate and returns past the buffet and still room. The equipment of the kitchen is likely to be arranged partly round the walls, but some of the equipment—for example, the range—may be free-standing. The various stores for goods, china, glass and food (larder) are arranged round the kitchen, while those dealing with bulk supplies should be planned near the service entrance or goods lift. The figure shows a useful supervision approach from the corridor passing the staff cloakroom and lavatory. Cafeteria service may be preferred; this subject is dealt with in several other sections of this book.

### Exhibition Halls

These should provide facilities for semi-permanent loan exhibitions, or exhibitions of current school work, or subjects of immediate technical or topical interest. The exhibitions vary considerably according to the subjects taught, and in an institute with many departments they are likely to be of very different sizes and character. An alternative to a central exhibition hall is to provide for small exhibits attached to each department, but there seem many advantages in the idea of a central exhibition hall, particularly in regard to contacts with the general public.

The essential factors in planning an exhibition hall of this type should be accessibility for public and students, and really good light; the former demands a position near the main entrance in order to control visitors and to keep them out of the circulations from which teaching rooms are approached. The windows should be placed at a high level, to leave clear the wall space below for exhibits either in cases or fixed to the walls. Top light should be provided when the remainder of the accommodation will permit. Any bays required should be formed with movable screens or cases, so that everything may be rearranged quickly and easily. Various information appertaining to rooms of this type may be found in the section on " Museums." Sizes cannot usefully be given, being dependent on the subjects taught, as some are more suitable as exhibition material than others. Some departments may require a museum or exhibition space used only for the work of that department. Such, for example, is a materials exhibition for a building department; such a museum should then form part of the departmental accommodation, and must be of a size suitable to the particular department. It is an advantage to prepare the walls of rooms to be so used for fixing or hanging exhibits. Heavy battens fixed horizontally to the walls at 12in. or 15in. intervals, either showing or behind a covering such as a fabric, are extremely useful. Glass cases of both wall and island types are often needed and should be designed in units which may be moved without too much difficulty except for those for permanent exhibits. For general purposes cases do not need to be more than 6ft. 6in. or 7ft. in height.

### Libraries

The provision of a library is now considered essential in all educational buildings. The library may be provided in one of two ways, or even a combination of both. A large central library has many advantages, but departmental libraries attached to other departmental accommodation may be preferred; but these seem more difficult to control, although the particular books students may need are more readily available to the students, especially if the latter are carrying out research work. The combined scheme caters for both types, and may be found very useful if the main library is used for general reading and reference and the departmental libraries are used as study rooms, with a limited selection of general works on a specific subject available. The provision of a general reading room with comfortable chairs and tables for study is an advantage, as students as less disturbed there. The total library space may range from 1,000sq. ft. in colleges with a capacity up to 1,500 students, to 2,000sq. ft. for the largest colleges. Planning information for libraries of this type has already been given fully in the sections on " Libraries " and " Schools." The general figures on which shelf space should be based is eight books per foot run and six rows or shelves in the normal height of a bookcase. A greater height than 6ft. 6in. or 7ft. for bookcases is of little value, as the books are out of reach without steps or ladders. *See* Part 1: Storage.

### Storage

The amount and positions of storage accommodation depend on the subjects to be taught, size of the institution, system of buying and acceptance of deliveries of materials and other supplies. Each department needs suitable storage space grouped with its other accommodation for storage of materials, apparatus, and often, it should be noted, of students' work in progress; the last need may require a very large amount of space in some departments.

General storage is needed for the administrative offices, school shop and bulk materials for cleaning and upkeep of the building, furniture, fittings, etc. Adequate and proper accommodation is essential for the cleaning staff of the building, where equipment and supplies may be stored and water supplies are available; cleaners' rooms should be distributed on various levels throughout the building.

Some large schemes may justify considerable accommodation for a maintenance staff, but in all schemes at least some storage space should be provided near the boiler room for the engineer in charge of the heating and electrical services, for carrying on minor maintenance work, and in which to keep supplies such as electric lamps.

### Caretaker

In most schemes accommodation has to be provided for a resident caretaker. As many buildings of these types are in urban areas the necessary accommodation must take the form of a flat, which may be placed in a semi-basement or on an upper floor, the latter being the most desirable. In less urban schemes a cottage is often provided. The general accommodation needed is a sitting-room, kitchen, two or three bedrooms, bathroom, W.C. and a store for fuel. If a flat is provided refuse (dustbins) should be considered carefully, and also some provision (for example, a balcony) for the drying of clothes; access to the flat should be provided from a secondary staircase and a secondary means of escape should be available if it is on the second or higher floor levels.

### Teaching Rooms

There are certain rooms used for teaching purposes which are likely to be similar in design for the use of almost all departments and subjects; such rooms include general lecture theatres, general classrooms and drawing offices. Many of the subjects taught only require an ordinary classroom with no special permanent equipment, and only the usual blackboard and lecturer's desk. It is proposed, therefore, to discuss first the requirements of such rooms as are capable of general application before considering special rooms for the teaching of particular subjects.

### Classrooms

Classrooms needed in technical schools are similar in most general respects to those described for secondary schools in the section on " Schools " excepting that technical schools have generally to provide for adult students; in consequence more floor space and desk area is needed per head. Desks should provide at least 2ft. run of desk per person, and preferably a little more, and it will then be found that a floor area of 20sq. ft. per person will be needed. Areas of 450sq. ft. and 600sq. ft. are convenient sizes for classes of 24 and 30 respectively. As in secondary schools, windows should be equal to at least one-fifth of the floor area and light should come mainly from the left-hand side of students. It is better that rooms should not exceed 20ft. in width, in order to provide adequate light on the desks farthest from the windows in rooms of normal heights; it is also desirable that classrooms should not be more than 30ft. long. Lecturers should have a raised platform about 9in. above the general floor level with a bench fitted with drawers and cupboards 6ft. 6in. long, 2ft. 6in. high, and 1ft. 9in. or even 2ft. wide. It is better that the entrance doors to rooms from the approach corridors should be placed at the same end of the room as the lecturer's platform.

Fig. 9 illustrates diagrammatically the layout of a classroom. Single or dual tables are the most usual equipment for classrooms, although some authorities prefer desks; whether desks or tables are used, these should be on the basis of 2ft. run per person, so that dual tables should be 4ft. long with access gangways of 1ft. 6in. between tables. Single tables require similar gangways on one side at least. Fig. 9 shows the essential dimensions of adult seating for general classrooms and also the incorporation of the wardrobe or book cupboards against the corridor wall as discussed previously, and detailed in Fig. 4. The position of the entrance door to the room should be noted, as it is set on the corridor face, and not on the inner face of the cupboards to economize floor space. At least 8ft. should be allowed between the front row of desks or tables and the wall for the lecturer's platform and desk. Gangways round the outside of seating and at the back should be at least 1ft. 6in. clear of any projections or radiators. If cupboards are provided against the corridor wall the gangway must be increased to 3ft. in width even if sliding doors are used for the cupboards; sliding doors save space, but are usually more noisy and costly than those hung on butts, and in addition, if they run easily there is a risk of fingers being pinched if they are hurriedly opened or closed.

### Tutorial Rooms

Some small teaching rooms for special classes are usually needed. Areas of 150sq. ft. are sufficient to accommodate classes of up to 12 students.

### Lecture Rooms

Lecture rooms, apart from normal classrooms, are required in many technical institutions: some rooms may be used solely by one department and others shared by several departments. The general requirements as regards seating are similar for most needs and vary mainly in regard to the lecturer's table and its equipment. If rooms are to be used by several departments they should be planned in such a position that they are easily available to all. Positions at ends of blocks of buildings near staircases are advantageous, as in such large rooms with steep tiers of seats, access may be needed at both ends of the rooms and consequently often at different floor levels. In smaller lecture rooms the access at both ends is less essential, and the amount of seating and height required for the tiers may be accommodated in a normal classroom or laboratory block, with the approach doors at the end nearest the lecturer.

Each student must be provided with a writing surface which should be 2ft. long. The floor area needed is at least 12sq. ft. per student, and a little extra is desirable for those with elaborate equipment for the lecturer. The shape of the room must provide good visibility of the lecturer's table or its full length and of any screens used for lantern slides or diagrams. Acoustics should be considered carefully when settling the main shape of the rooms. The windows should be confined to the side walls and top light avoided, as it is often necessary to provide blinds to darken the room completely in daytime. Provision has to be made for a lantern and it is now desirable to provide also for a cinematograph, which may be used at least occasionally. In some lecture theatres two lanterns may be needed simultaneously. The lecturer's desk should be as long as possible, leaving only the necessary amount of clearance at each end for easy circulation; these desks or benches are usually 3ft. wide and 3ft. high, with such services available as gas, water, electricity as are necessary for the purposes of the demonstrations.

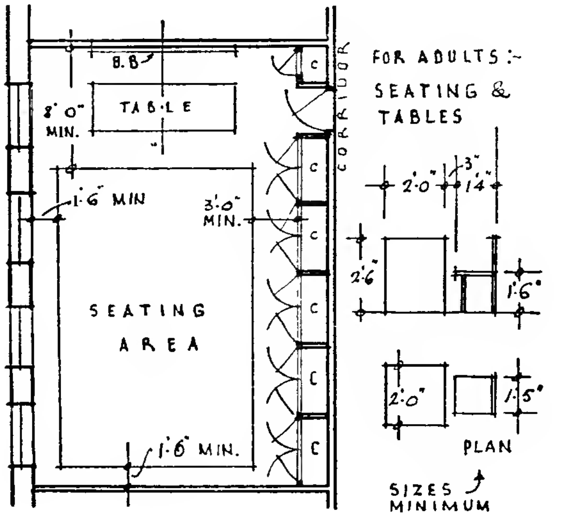
Fig. 10 illustrates three typical lecture room plans, two being smaller types and one a larger type. The main difference between Types A and B is that the seating is curved in Type B for the improvement of vision; both of these types rely on a single entrance near the lecturer's desk and have a small rise of, say, 6in. for each tier of seats, so that the accommodation may be provided in the normal floor to ceiling height needed for other rooms, leaving head room of about 7ft. above

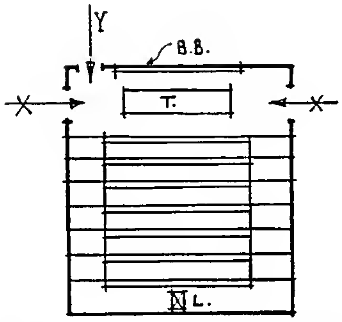
the back or highest tier. Type B is better than Type A, but considerably more expensive in first cost. In both these examples the lantern screen is dropped over the blackboards placed behind the lecturer. Type C requires more than the normal height of one storey and consequently the main (students') entrance is at the level of the top-most tier of seats. The steppings of the tiers are of a steeper pitch than in Types A and B, being 10in. to 12in., and necessitate the introduction of intermediate steps in the gangways. Sometimes the rise of the steppings is increased towards the back of the room to improve vision. In this example the lanterns (and cinema projector if provided) are separated in an operator's box; two lanterns are shown to permit simultaneous projection, while the walls at each side of the lecturer are splayed to assist vision, at the same time leaving the centre part of the wall behind the lecturer free for blackboards, diagram screens, fume cupboards, or other apparatus. Exits are available at both ends of the room, which is essential in all larger lecture theatres. A small room adjoining the lecture theatre is desirable for the lecturer; it is essential in many cases for chemical and other scientific lectures, and for all preparatory work. Fig. 11 shows the normal basic dimensions for lecture room seating; it is desirable that the seats should be made to tip up, to give easier access to seats away from gangways. Writing surfaces should be at least 15in. wide for comfort when taking notes, although they are often made rather less, and at normal table height of 29in. or 30in. above the floor.

## Gymnasium

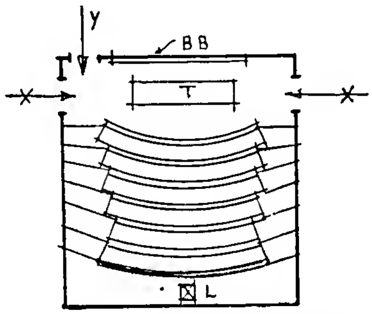
A gymnasium is now required in almost every educational building, while in large schemes more than one is necessary; they should be so placed that they are grouped together and are equally accessible from all sections of the building. It is an advantage if gymnasia can be planned as detached buildings in order to isolate noise likely to disturb any nearby teaching rooms; covered connecting ways are desirable if the gymnasia form a separate unit, since they give a protection to students passing to and fro with no outdoor clothing. A clear floor area of at least 2,800sq. ft. should be provided for classes of 30 students; the room should be not less than 40ft. wide.

Fig. 9 Classrooms

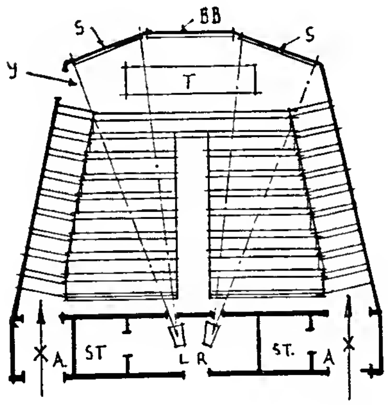



A General purpose




B As A with curved seating




C Large, general purpose

Above: Fig. 10 A, B and C Lecture rooms

KEY
T—demonstration table
X—students' entry
Y—lecturers' entry
A—lobby
LR—lantern room
S—screen
BB—blackboard
L—lantern

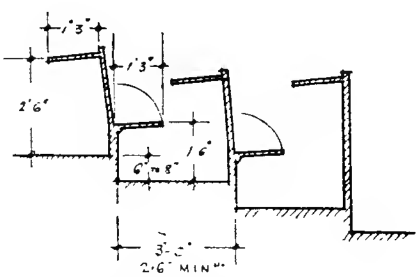



Fig. 11 Lecture room seating, at 2ft. 0in. centres, section

A height of at least 18ft. is necessary, and if possible there should be a flat ceiling to which apparatus may be attached. It is an advantage if one long wall can be opened for a considerable part of its length and face southwards, with suitable doors leading to a space for open-air exercises. If one wall is almost entirely occupied by windows it may limit the wall area available for apparatus such as wall bars, but access to a suitable open space may be considered a greater advantage. Information on the planning of gymnasia has been given for secondary schools and, except for a rather larger floor area desirable for adults, the same information applies to technical schools. Windows should be placed on both sides of the room and extend from the ceiling to about 7ft. 6in. above the floor; windows with sills lower than this level are partly hidden by apparatus, thus becoming inaccessible, while the student, being silhouetted against the light, cannot be watched satisfactorily by the instructor. Changing room accommodation should be provided for on the basis of the anticipated maximum number able to use the room at any time, and if two sexes are likely to use the room at different but immediately successive times, it will probably be found desirable to duplicate changing rooms and lavatories; changing rooms need an area of 7sq. ft. to 10sq. ft. per person. Shower baths and lavatory basins should be provided at the rate of about one to every six or seven persons. W.C.s and urinals are desirable and provision for two of each is usually adequate. Two other rooms are necessary, one for the instructor, and one, opening directly out of the gymnasium, for apparatus storage; both these rooms need an area of about 100sq. ft., and the latter should have a pair of doors so that large equipment may be moved easily. The finish of a gymnasium floor usually consists of secret nailed boards laid across the room on joists. Radiators should be in recesses, and good artificial light should be placed near the ceiling with even distribution over the whole area.

Sometimes a gallery for spectators is needed and this may often be planned with advantage over the changing rooms, instructor's room and apparatus store, which do not need the same height as the gymnasium itself. Two staircases to the gallery are desirable, suitably placed to give quick and easy access and exit without visitors having to enter the gymnasium itself. If a gallery is provided, fixed wooden seating is needed in tiers rising rapidly towards the back, as this arrangement gives as clear a view of the floor as it is possible to arrange. (*See also* section: "Schools.")

**Drawing Offices**

Rooms for drawing, apart from those needed in art schools, are required in connection with many subjects, more especially building, architecture and engineering. Two main types of drawing office or studio accommodation are needed; first, rooms used solely for the purpose; secondly, rooms which also have to serve as normal classrooms. In the former, high tables or benches are usually provided, and in the latter normal-height desks or tables have to be used, since high benches, even with stools, are not satisfactory when the room is used as a classroom. Equally, it must be realized that such accommodation is makeshift and not suitable for more advanced teaching of drawing. Junior students usually use "half-imperial" drawing-boards and T-squares, and two such students may generally be placed in a length of 5ft. 6in., or even three in 7ft. 6in. But senior students usually need larger boards (up to "double elephant") and more space for instruments, books of reference and drawings to be consulted, with the result that a space of 5ft. or more, according to the type of work, is essential for each student—except for architectural students, who require at least 6ft. 6in. The width for general purposes should be 3ft., although this is often reduced to 2ft. 3in. which will accommodate an "imperial" board. The sizes of drawing-boards usually used are "half-imperial" for junior students, "imperial" for seniors, and "double-elephant" for architectural work. Gangways between tables should be at least 3ft wide, and preferably rather more when large boards are to be used; this gangway width is controlled by the fact that students may wish to stand up when working and may need to work vertically on the long dimension of the drawing-boards. Rooms used as both classrooms and drawing studios should have tables of the normal height of 2ft 6in., although in some building schemes specially low tables are adopted. But other drawing tables should be 3ft. high, so that students may stand up and work comfortably; footrests are desirable on high tables. Tables usually have flat tops with blocks for tilting drawing-boards.

Good daylight is most essential in drawing studios, and the light source must be in front of the student or from the left-hand side; remembering this, it may be considered more satisfactory to place the tables parallel with the windows instead of facing towards the lecturer's table and blackboard at one end of the room. Blackboards are essential and it is usual to provide a lecturer's table or desk on a low platform, although this, perhaps, is not essential for the teaching of all subjects.

Fig. 12 illustrates two methods of arranging tables in drawing offices. It should be noted that rooms of this type require very large floor areas per head of senior students if adequate table-space is to be allowed. The figures are given on the basis of 7ft. 6in. run of table per senior student. This gives an area of about 70sq. ft. per head, but the allowance can be reduced considerably in those departments where smaller drawing-boards are used and less table-space is needed for instruments and reference purposes. For junior students or classroom purposes the same 7ft. 6in. tables will accommodate three students (approximately 24sq. ft. per student) and, in addition, the gangway spaces may be reduced and extra tables added to give a floor area of 20sq. ft. per head, as is usual in general classrooms.

North or north-east aspect is desirable for drawing offices or studios; it is an advantage to have top light in addition to side windows. Diagram A in Fig. 12 is based on providing light on the left of each student and Diagram B on having the windows directly in front of the students.

Ample space must be provided for the storage of drawing-boards, tee-squares and, when required, portfolios or other systems of drawing storage. If rooms are likely to be used by different classes at various times, as they are when day and evening students (both of whom may need to retain drawings fixed to the boards) are taken, the amount of space necessary for such storage is very large and this space must be so arranged that the drawings

do not become damaged. The best method seems to be the provision of racks for the vertical storage of boards inside a cupboard, which can be closed to keep as much dust away from the drawings as possible. There should be racks for each size of drawing-board used, allowing approximately 3in. from centre to centre of boards. T-squares may either be stored with the boards or hung by their heads on separate racks. Many departments may require considerable storage space for models and samples used for demonstration; these are best placed on shelves in cupboards, if their size will permit, so as to eliminate constant cleaning and reduce the likelihood of damage. The storage rooms are best approached out of the drawing offices themselves; it may be found convenient to plan a space, the full length of the rooms and about 8ft. wide, between two drawing offices and divide it to make one store room for each drawing office.

**Departmental Accommodation**

It is proposed to continue this section by summarizing information relative to the accommodation necessary for the teaching of certain specific subjects; the subjects are so numerous that it will only be possible to consider those for which special provision has to be made in most, if not all, districts. Many subjects can be taught in a combination of the general rooms already outlined, so that this further information is definitely linked with special requirements for particular subjects. The accommodation will be considered in groups in the following order: Commerce, Art, Domestic Science, Building Science and Engineering.

**Typewriting**

A special room is usually set aside for the teaching of this subject. In view of the amount of noise created, precautions should be taken to prevent disturbance of surrounding rooms by the introduction of sound-deadening materials in the floors, walls and ceilings. Tables are usually about 2ft. 6in. long and 1ft. 9in. wide. Each student should have a separate table and, if possible, an individual source of artificial light; good left-hand daylight is also essential. Wide gangways should be planned to permit the teacher to have access to one side of every student. Fig. 13 shows a typical layout of a typewriting room, but the area may be

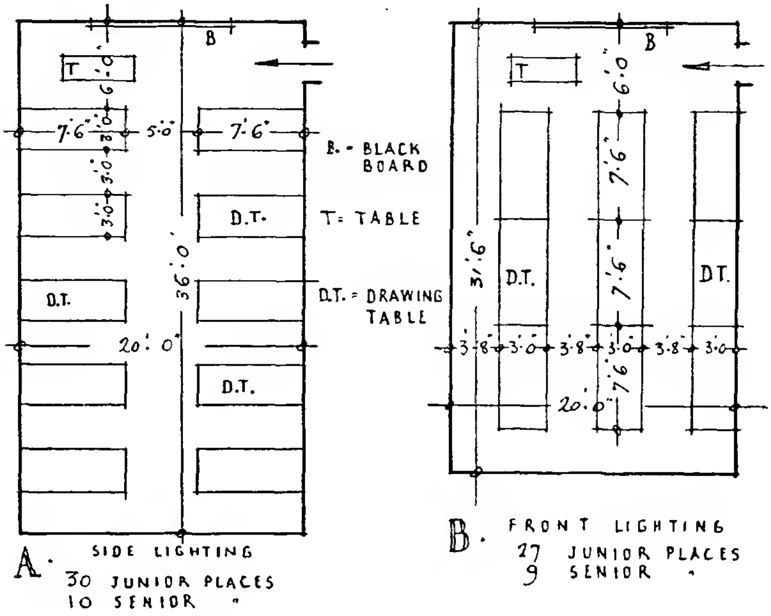



Fig. 12 Drawing offices

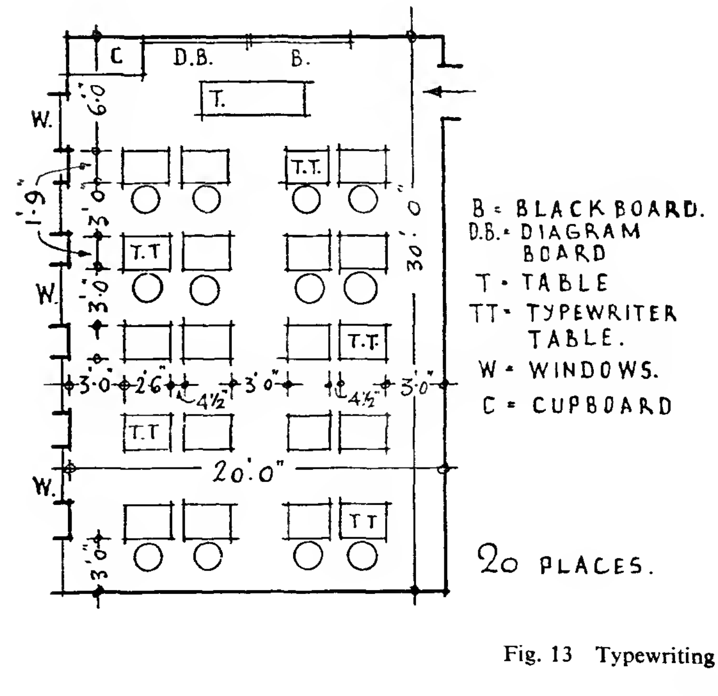



Fig. 13 Typewriting

reduced to 25sq. ft. per student by adding a further row of tables for 24 students in the area of 600sq. ft. (*See also* section: " Schools.")

**Commerce**

The work of many of the subjects considered in this group may be taught in normal classrooms as already discussed. These classrooms should accommodate various numbers of students; some rooms should be designed to seat 20, and the remainder 30 to 35. A lecture theatre or room large enough to hold at least two classes is useful. Very ample blackboard space is exceedingly important for most of the subjects, as are also large areas of wall space for charts, diagrams, pictures, etc., at a level of 5ft. to 8ft. above the floor.

Commercial subjects cover a very wide field and in many districts may represent a large part of the technical education of the students. In view of the wide scope of secretarial work, book-keeping, languages and the distributive trades, a large library or part of the main school library should be set aside for them. The specialized rooms may include rooms for geography and typewriting, commodities, rooms for grocery, butchery, clothing and window-dressing, and rooms for mechanical appliances needed in the teaching of the various subjects and trades. A laboratory may be needed for the scientific side of certain trades and a studio for teaching design, colour and window-dressing crafts. Noise should be considered in placing typewriting rooms so that they do not disturb other teaching, and quietness is essential in rooms for the teaching of languages. In regard to the latter, a series of small rooms, where gramophones may be used by small groups of students without disturbing one another or the surrounding rooms, may be considered necessary. Careful consideration must be taken in the design of such rooms; soundproof qualities should be ensured, but at the same time the rooms must be well ventilated.

**Commodities Rooms**

The requirements of these rooms are entirely dependent on the subjects to be taught, but generally rooms about 1,200sq. ft. are required to provide space for shelving, display work and demonstration benches for classes of 30 students. In addition, a store of 200sq. ft. is usually necessary. At some centres in larger cities the rooms may be equipped to represent a part of a shop for particular trades.

**Display**

When this subject is to be taught, ample space for one or more typical window spaces, with special lighting, should be provided in addition to teaching space. Several benches are also needed for the preparation of large areas of paper, light woodwork, etc.

An area of 1,000sq. ft. is required for a class of 20 students, to which should be added a store of about 250sq. ft.

**Mechanical Appliances**

Owing to the increase in the use of mechanical appliances in shops and offices, a room may be needed for demonstration of such appliances as calculating machines, dictaphones, cash registers, cutters, mixers and sorting machines as used in various trades. Care should be taken to isolate the noise from these machines.

**Art Departments**

These departments sometimes form part of the accommodation of a technical college, but frequently there are separate schools or colleges of art in self-contained buildings. When they are separated from other departments they need their own administrative rooms, together with general or communal rooms, which would otherwise be shared with other departments in large schools. The principal subjects taught are drawing, painting, modelling, various crafts and, in some cases, architecture; the last is sometimes independent or linked to a school of building.

The principal rooms are studios for each section such as drawing, painting, design, life-classes and modelling, and workshops for each craft which is likely to have sufficient students to justify separate accommodation. One lecture theatre is usually adequate, except in very large departments. Studios should be placed together in a quiet position, where, for preference, north light is available; it is also advantageous in multi-storied buildings to place the studios on the topmost floor or in some other position where partial top light may be arranged. Craft rooms, on the other hand, do not need true north light and, since many involve noise in their use, they may be placed on noisier parts of the site, such as street frontages. The control of noise emanating from craft rooms must be carefully considered in order to prevent disturbance in other rooms. All the various craft rooms are better grouped together to facilitate the concentration and distribution of services.

**Studios**

General studios for drawing, painting, design and modelling require a floor area of about 50sq. ft. per student and a height of about 12ft. If really good side light is available, top light may be omitted for some of the rooms, but when circumstances permit, *some* top light should be provided. Although very large window areas are most essential, blinds for control of the light should be installed. For windows the blinds should be arranged to lift from the sill in preference to being pulled down from the window head. For general studios rectangular rooms, with windows occupying the full length of one long wall, seem most satisfactory; a width of about 25ft. and length of 40ft. have often been used. and seem satisfactory. Fixed furniture is seldom required, except in design studios and the type of equipment and furnishing is very varied. It is wise to provide facilities for hanging drawings on the walls not occupied by windows, and to arrange for blackboards and/or lantern screens; cork, linoleum or similar substances which hold drawing pins easily, are useful as wall facings from the dado to a height of 7ft. above the floor, or alternatively horizontal battens may be fixed at frequent intervals from 4ft. to 7ft. above the floor. A sink should be installed in all studios. As an alternative to the sink in the studio itself, it is an advantage to have a small sink room adjoining the studio and entered from it, as shown in Fig. 14, so that water and general untidiness may be kept outside the studio itself; this arrangement is certainly to be preferred for washing brushes in painting studios. As shown also in Fig. 14, a store for work, both finished and in progress, may be planned adjoining each studio by adopting the layout suggested, while in rooms used for modelling the dividing partition may be omitted and the whole of the space of the sink room and store may then be given over to sinks and clay bins. Fig. 14 also shows the amount of top light, that is, one-third of the

floor area, that is desirable in these studios; the remaining two-thirds of the ceiling is left flat and plastered. The windows on the side walls should have a sill height of about 3ft. above the floor level. Blind-boxes in modelling rooms should be fixed at the sill level and the blinds made to draw upwards. Provision for a lantern should be made in all rooms used as general studios. Studios to be used for subjects such as architectural drawing should be designed as already discussed under the heading of drawing offices, since the benches are normally in fixed positions and the usual side-lighting is adequate.

### Life Studios

These vary little from general studios, except that it is often found that a square room is the best for grouping students round the model's throne. The area may be reduced to 40sq. ft. per student; thus a room having an area of 850sq. ft. accommodates a normal class of 20 students. A small dressing room or cubicle equipped with a lavatory basin, and preferably placed near the throne, is needed for the model. Local heating is required for the throne, in addition to the general heating for the room; this is usually provided by means of electric radiators which concentrate the heat near the model and do not heat the remainder of the room more than is necessary. The artificial lighting should be considered in two groups, the first lighting the model and the second lighting the students' work; the former may be provided by means of easily adjustable floodlights near the model, while the latter should be shaded to illuminate the students' easels. Fig. 15 illustrates a typical life room, with a small room (about 60sq. ft.) for the model and a store room attached. The entrance to the life room is better placed away from the throne. In addition to side lighting from windows placed on the left-hand of the students, top-light is desirable. (*See also* section " Schools.")

### Craft Rooms

The requirements of these rooms are largely dependent on the craft taught and are simple from the planning point of view. Rooms having an area of 800sq. ft. to 1,000sq. ft. are generally adequate for the arrangement of any special furniture needed for each type of work. Very good light is of the

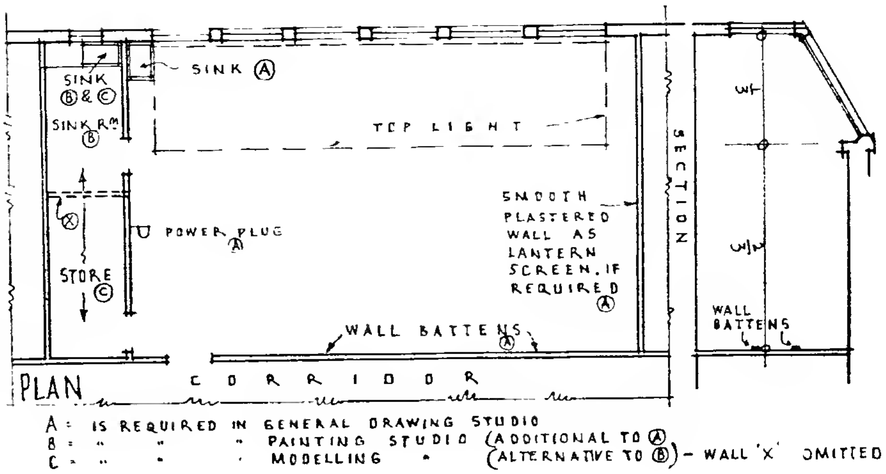



Fig. 14 General art studios

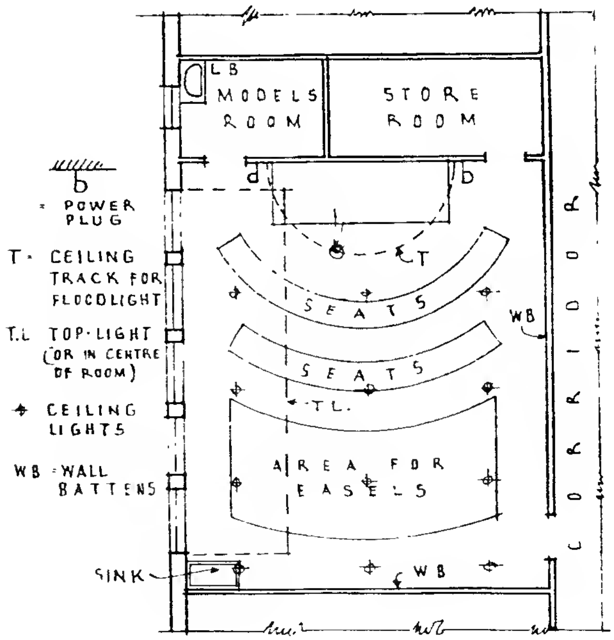



Fig. 15 Life studios

utmost importance, as the work is often concerned with small detail. Electric power, water and gas services may have to be provided at students' bench points and at the lecturer's table or demonstration bench.

Special provisions to meet particular needs, such as kiln rooms, photography, printing, etc., are frequently necessary and involve considerable variations if adequate space is to be provided.

### Domestic Science

This department is concerned with a wide variety of subjects, mainly or entirely for women students. The more usual subjects are cookery, dressmaking, laundry and housecraft. Apart from rooms for specific purposes, a number of classrooms are commonly needed for general subjects. It is desirable to group rooms together as much as possible, and proximity of the cookery rooms to the general refreshment room (when one is provided) permits students to be taught large-scale catering, as is necessary for any type of institutional work.

### Cookery Rooms

Small classes of about 15 persons are most satisfactory, and rooms for this number need a floor area of 850sq. ft. The rooms should have a north-east aspect. One room is often set aside and equipped for demonstration only, and the remainder of the rooms are for the students' own work; all rooms, and especially the equipment, should be so arranged that demonstrations may be given without undue discomfort to students. Demonstration rooms should be equipped with a gas range, an electric range, a long preparation table, and behind these fittings should be placed some cupboards and shelves or racks for utensils and china, and a sink with draining boards; seats should be raised, so that students have a clear view of the utensils when placed on the ranges.

The normal teaching rooms may be equipped in many ways. A number of work tables, ranges (both gas and electric), sinks, draining boards, cupboards and racks are required, and the ideal layout would provide one complete set or unit of equipment for each student in the manner of a small individual kitchen; such an arrangement prevents students impeding one another's work. The general equipment, however, seems to be about four ranges, a length of work table for each student, two sinks and draining boards, cupboards and racks to be used in common by all students.

Attached to the cookery rooms there should be a larder for food storage, a pantry for storage of utensils, china and glass, and a general store. The first two of these storage rooms should be of good size, and have shelf accommodation on all sides and a window, which in the case of the larder ought to have a north-east aspect. A refrigerator is generally needed and should preferably be placed in the cookery room itself. Larders and pantries should lead directly out of the cookery rooms. Some schools provide a small room adjoining the cookery room and connected by a serving hatch, for teaching the serving of meals; this room may often form part of the housecraft accommodation. (*See also* section : " Schools.")

### Needlework

Needlework rooms for teaching dressmaking and millinery are generally about 1,000sq. ft. for 20 students and should have fitting rooms with an area of 150sq. ft. attached. Frequently a small annexe is provided to serve as a lavatory, and equipped with several lavatory basins with hot and cold water. When several needlework rooms are provided it may be found advantageous to place the fitting room or rooms between two main teaching rooms and divided from them by movable partitions as shown in Fig. 16. Then one large room can be provided for lectures or special demonstrations.

### Laundry

This subject requires considerable space per student and for a class of 24 an area of 2,000sq. ft. should be provided. One large room will accommodate all the apparatus necessary, but the space is sometimes divided into two, connected by drying and airing rooms. One part should contain all the washing equipment and the other the ironing, finishing, folding and packing apparatus. The type and amount of equipment varies according to the importance of the subject in the general training.

### Housecraft

Some schools provide typical domestic rooms for use in conjunction with the teaching of this department; similar rooms are discussed in the section on " Schools."

### Other Rooms

Rooms may be required for teaching such subjects as upholstery, curtain-making, household repairs and similar trades. They should have an area of 1,000sq. ft., with large storage accommodation (about 300sq. ft.) for work partly finished, materials and spare tools; in addition to work tables, cupboards, racks and drawers are needed for tools and materials in use. Except in very large domestic science departments, special art rooms and science laboratories are not provided and use is made of rooms in other departments.

### Building Department

This department is likely to be needed for day and evening students and often requires a very considerable area. In addition to the actual workshops necessary for each trade in building, classrooms, drawing offices, laboratories, large storage spaces and a museum are essential. Architecture forms part of this department in many schools and for this subject various extra rooms, principally studios, have to be provided. The trades for which workshops are required include carpentry and joinery, plumbing, bricklaying, masonry, plastering and painting and decoration. Cabinet-making, although sometimes treated as a separate subject, often forms part of the building department.

It is desirable that all workshops should be grouped together and placed in such a position that the noise emanating from them does not disturb other rooms. They are best placed on the ground floor, and it is generally an advantage to arrange them as a single storey block which permits of the introduction of top light as well as side windows.

Road access is of importance for deliveries of heavy materials. It has been suggested that workshops might be planned round a large and high room which can be used for the erection of large samples of work, even small buildings or portions of buildings.

Classrooms and drawing studios have already been discussed above.

### Building Science

A special room is likely to be required for this purpose. It must be part laboratory, part clear space for large

testing equipment and apparatus, while some portion of it, or an annexe, must be set aside for the storage and mixing of materials and use as a balance room. An area of 1,200sq. ft. is ordinarily sufficient for the average class in this subject, but for advanced students rooms of half this area are often provided in addition.

The room should be equipped with flat-topped tables 2ft. 6in. wide and 2ft. 9in. high. These may be used either for experimental apparatus during lectures, or even for drawing. The tables should be placed on one side of the room, leaving only sufficient space for a fixed bench, sinks under the windows and a gangway. In this way as much area as possible is left clear on the side away from the window for machines and apparatus, as shown in Fig. 17. The fixed bench under the window should be equipped with gas, water and electricity.

An adjacent small room (about 250sq. ft.) should be equipped with shelves for mixing samples and a sink and bins for materials such as cement, sand and plaster, but not for bulk storage. A room attached to this laboratory, to be used as a permanent exhibition of building materials, is very useful.

### Carpentry and Joinery

Workshops for this subject are, as a rule, planned for about 20 students, and should be equipped with double benches 6ft. long by 2ft. 9in. wide, with an assembly table 10ft. long by 3ft. wide. Tools and small work in progress are stored in lockers under a portion of the benches, but larger work must be stored in cupboards or in a small store room attached to the workshop. An area of about 1,000sq. ft. is needed for 20 students. A timber store of 250sq. ft. should adjoin the workshop and must permit of handling long lengths of timber.

A machine shop is sometimes required as a separate unit. In smaller schemes space for a limited number of machines must be allowed for in the workshops. Wood block floors should be provided throughout. Gas or electricity is needed for glue heating; electricity is generally used for driving the woodworking machines. The machine shop needs a floor area of 750sq. ft. to 1,500sq. ft., according to the amount of plant and the type of tuition provided. (*See also* section: "Schools.")

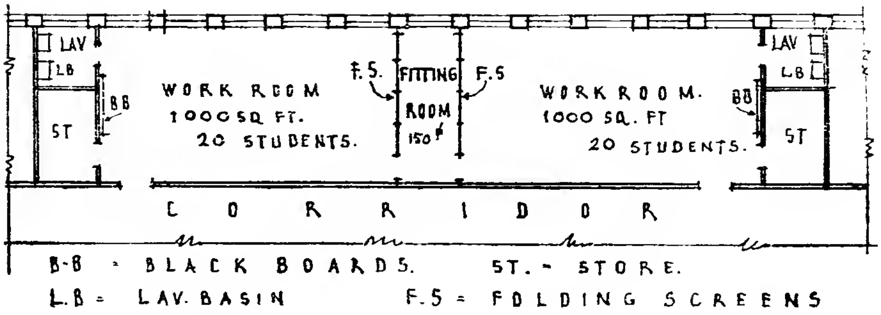



Fig. 16 Needlework rooms

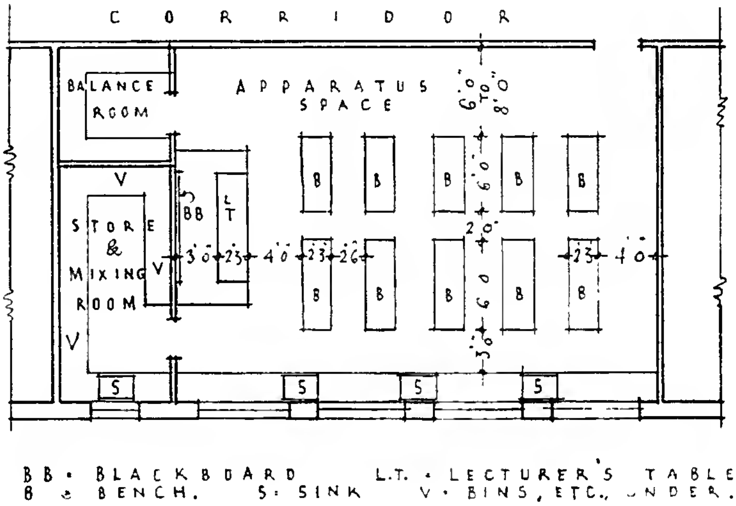



Fig. 17 Building science laboratory

### Plumbing

For normal classes of 15 a workshop having an area of about 1,000sq. ft. is needed.

Wall benches 2ft. 6in. wide should occupy a portion of the walls; the remainder of the students may be accommodated at benches, allowing 3ft. 6in. of length per student. The benches should be 3ft. 6in. wide, to allow students to work on each side, and 2ft. 6in. high.

A large store is needed ajoining the workshop for storage of work in progress and also for large sheets of material.

### Plastering

A room having an area of 1,350sq. ft. will accommodate 15 students comfortably. North light and good wall access for teaching plastering are both desirable. Benches should be 2ft. 6in. high and 4ft. or 5ft. wide. One large bench may be needed for setting out and cutting moulds. Bins for materials and cupboards for tools are necessary. Cubicles are often built to represent small rooms for practice in plastering work; to eliminate scaffolding, these cubicles should have low ceilings. Water supply and sinks and gas for heating gelatine are essential.

**Brickwork**

A normal class of 15 students requires an area of about 1,350sq. ft. Most of the work is built on the floor, which should be of granolithic or some other hard material. A few benches are needed for cutting and rubbing and some wall benches 3ft. wide, allowing 4ft. run per student, for "gauged" work. A large store is needed for materials, with a part set aside for mortar mixing.

**Painting and Decorating**

Most of the work is done either at fixed benches or on easels. An area of 1,000sq. ft. to 1,200sq. ft. is sufficient for 20 students. Benches should allow 4ft. 6in. length per student and should have a width of 2ft. 8in.; double-sided benches are sometimes employed, but single-sided ones are better. A brush trough about 5ft. long by 2ft. wide is essential, and a sink with hot water is needed for brush-washing. As a rule a dustproof cubicle is also required. A spray room of about 300sq. ft. is often required and, in addition, ample storage space is essential.

**Masonry**

A room having an area of 1,350sq. ft. will accommodate 15 students comfortably. Large tables are needed for setting out, and "bankers," 3ft. by 2ft., are needed for the actual working. Power machinery may be used in some schools; the area is governed by the number of machines necessary.

**Cabinet-making, etc.**

A shop similar to that needed for carpentry and joinery, together with a small amount of machinery, is usually required; single benches are desirable.

In some districts cabinet-making in all its branches may need a large department of its own to provide not only for cabinet-making proper, but also for carving, veneering, polishing, upholstery and even chair-making. Veneering may be taught in many schools, since it plays an important part in both joinery and cabinet-making to-day; considerable space is needed to provide for glue tanks, veneering presses, cutting tables and a special veneer store.

The polishing workshop should provide for one or two spraying chambers as well as benches for hand work; the combined area needed for a well-equipped workshop for 20 students is 1,200sq. ft. Carving only requires a small area per student, and a general allowance of 30sq. ft. will be found adequate. Each student requires 3ft. 6in. length of bench 2ft. 6in. wide, placed preferably against a wall. Upholstery needs a much larger area, as some machinery is generally installed and several large tables are necessary for planning and cutting out. One wall should be equipped with a series of dummy windows of different types and sizes for exercises in curtain and pelmet work.

**Science Department**

Depending on the type of college, this subject may be subdivided into many groups, such as chemistry, physics, pharmacy and metallurgy, and each group further subdivided into more specialized groups. These subjects may only form minor needs of various other departments, or may be complete departments in themselves. The main space requirements are classrooms, lecture rooms and laboratories, each fitted to provide for the teaching of a particular subdivision of the subject, together with the necessary preparation rooms and research rooms.

There are two main positions in a technical school for the chemistry and similar departments; the first, ground floor level, where the problem of handling a very complicated drainage system may be controlled more easily, and the second, a top floor where ventilation is more easily provided efficiently. Lecture rooms, of which several are likely to be needed, are similar to the general lecture room already described, except for additional specialized apparatus, such as fume cupboards, and extra services. Chemistry lecture rooms should have a preparation room, with an area of about 400sq. ft., adjoining; the equipment should provide a bench with all services, glass-fronted cupboards and a sink with hot and cold water.

**General Laboratories**

The average laboratory for general purposes requires a floor area of 1,000sq. ft., which will accommodate about 30 students. For some subjects this area may be reduced a little but for many others rather more space is often desirable.

Very good light is necessary, and when the plans will permit, the addition of top light or light from two sides of the room is advantageous; cool aspects are preferable.

The planning does not present many difficulties other than those involved in the provision of certain complicated services such as drainage, ventilation, gas and electricity. The floors need special consideration, as the drainage is generally in the form of deep, open earthenware channels below floor level with removable floor coverings. Artificial ventilation is almost essential and it should be provided in a simple manner, but at the same time, metal ducts which may be subject to corrosion, should be avoided. Benches are usually 3ft. high and often double-sided, unless the rooms are to be used for formal lectures. Sinks are needed between every two students in chemistry laboratories, but less frequently (if at all) in laboratories for other science subjects. The detail design of benches and shelves is entirely dependent on the particular use of each laboratory; benches should provide at least 3ft. 6in. run per student. Each student should have a locker, which should be at least 18in. wide, 15in. high and 15in. deep, for storage of apparatus; these lockers may be under benches in laboratories used by a limited number of students, but in most schools, particularly those with evening classes in addition to day students, the number of students using each room necessitates the provision of sets of lockers in positions other than under benches. Many laboratories need special benches or fittings in addition to the demonstrator's bench and normal students' benches. Such fittings include drying ovens, fume cupboards, combustion benches and washing-up benches; the latter are usually provided as wall fittings. Benches for general and inorganic chemistry, pharmacy and physics as a rule have teak tops, but for organic chemistry lead-covered tops are often provided. Organic chemistry requires a fireproof cupboard and a combustion bench with a concrete top; for physics much clear space on walls and floors is necessary. Benches in chemical laboratories should be fixed, but in laboratories for other subjects are often made movable. (*See also* "Schools.")

**Balance Rooms**

These rooms must be planned so that they are readily accessible to all students. An area of 250sq. ft. is required. The room is usually long and narrow; exceptionally good light is

essential, preferably from windows facing north. The shelves on which the balances are placed are best made of slate or stone and should be 18in. wide and 3ft. above the floor. So that students may sit back-to-back and leave a clear gangway, there should be at least 7ft. between balance shelves on each side of a room.

Fig. 18 illustrates a typical layout of the laboratories in a small chemistry department. The two laboratories, one for elementary and one for advanced students, are placed on each side of a balance room accessible from either. There is a preparation room at each end of the unit. Blackboards and demonstrators' benches may be placed at either end of the rooms as thought desirable by the teacher in charge, who may then control and be close to the preparation rooms if he wishes. Alternatively, the students may have freer access as shown on the figure.

Fig. 19 illustrates a typical suite of physics laboratories. Each laboratory has a preparation room and a darkroom accessible from it; the preparation rooms in this case do not need such large areas as those for chemical laboratories and are here shown grouped together between the two main rooms.

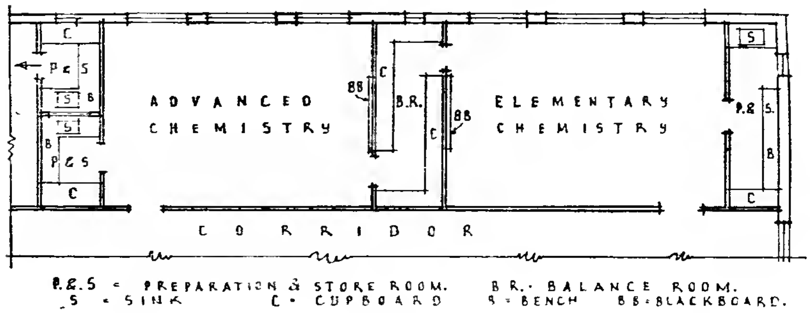



Fig. 18 Chemistry laboratories

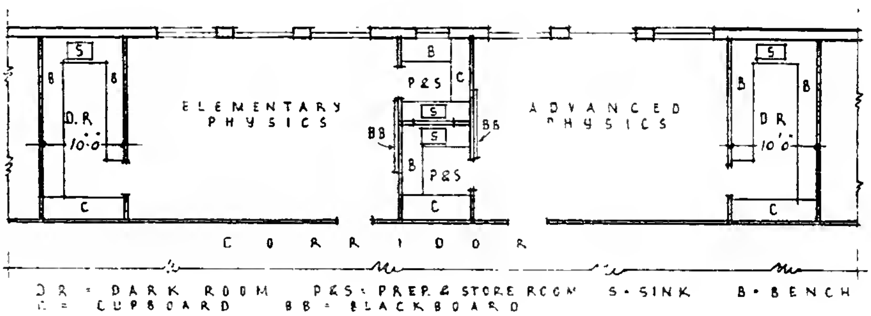



Fig. 19 Physics laboratories

### Store Rooms

Considerable storage space is necessary in science buildings for the storage and issue of chemicals and apparatus to students and the bulk storage of materials and large apparatus. External storage may be needed for inflammable materials.

### Research Rooms

Some institutions may require a number of small laboratories for research work. Rooms having areas of 150sq. ft. upwards should be equipped with fixed wall benches and central movable tables.

### Darkrooms

For physics departments dark rooms are needed and should be placed where they are easily accessible from the laboratories. These rooms should be about 10ft. wide and should allow 8ft. length of bench per student. Wall benches are usual, and at least one sink should be provided.

### Engineering Departments

The work likely to be covered by these departments varies considerably and includes a very wide range of subjects such as civil, mechanical and electrical engineering, geology and metallurgy. In addition, access to laboratories for closely allied studies such as physics and chemistry must be available. Much of the work of many engineering departments may be taught in classrooms, lecture rooms and drawing offices as already described, but laboratories and workshops are necessary in addition. The use of engineering plant and machinery may involve considerable noise and care must be taken to isolate classrooms and lecture rooms from disturbance.

The requirements for engineering subjects are so varied that the precise needs of each room must be laid down for each individual building by the promoters of the scheme. Any general information such as could be given in this book would be of little value.

### Other Departments

As already stated, buildings or departments are required in different localities for the teaching of special technical subjects. But as many of these are called for only occasionally, the authors do not feel that the detailed planning is of sufficient general interest to warrant inclusion.

## Introduction

The basic aim is to create in the community centre a positive instrument to promote culture and to encourage harmonious and balanced living, so that the individual finds purpose and achieves self-expression in service to the community, and learns to live a fuller life.

The activities, therefore, for which community centres may cater are numerous and diverse. In the past some activities have existed in towns and villages, centred on the village hall, or associated with religious bodies, adult schools, sports clubs, boys' and girls' clubs, political clubs and even the public house. In each case, however, these activities have been somewhat disassociated, often by " class distinction " based on income, and seldom brought varying age groups together, and often separated sexes unnecessarily.

The present interpretation placed on " community centres " has changed and the need for centres is growing in both urban and rural areas. It is undoubtedly greatest in areas where new housing schemes are contemplated and where no facilities exist for recreational, instructional and religious purposes; but equally there is a demand in existing towns, where buildings are not planned or suitable sites are not allocated.

In rural areas the need may be considered by some to be less important than for urban areas for reasons such as the wide-spread population and the fact that country dwellers have more to occupy their leisure time, but if rural life is to be made attractive, facilities similar to those in urban areas are of importance to foster the life of a community.

Increased leisure is a factor of today and the future, and facilities for the use of this leisure are of increasing importance. Many forms of activity need accommodation not available in the home; others are of an educational type which necessitates communal buildings. The main aim, therefore, in the planning of community centres should be to provide for neighbours to get together for social, recreational and educational activities on an equal footing.

A valuable report on the whole subject was prepared by the Ministry of Education in 1944, entitled " Community Centres " (H.M.S.O., price 9d.). Much work has also been promoted by the National Council of Social Service, which includes community centres as a part of its activities; it provides literature, and general and even financial assistance. The same body has issued a number of helpful publications on the organization of community centres and village halls.

The Miners' Welfare Commission provides similar centres in mining communities with funds derived from the Miners' Welfare Fund. Some industrial and commercial undertakings also erect and finance centres for their own staff in housing or working areas.

## Legislation

Local authorities for higher education are given powers by Section 86 of the Education Act, 1921 as amended by Section 6 of the Physical Training and Recreation Act, 1937, to assist with setting-up and financing community centres; Section 80 of the Housing Act, 1936 confers power on local authorities, with the consent of the Minister of Health, to provide and maintain buildings and recreation grounds in connection with the requirements of persons for whom housing accommodation is provided. The Education Act, 1944 and subsequent legislation require the provision of facilities for further education, and for recreation and social and physical training. Local authorities may thus assist the provision of community centres with buildings and with the cost of staff and maintenance. These facilities have been used, but so far to no very great extent.

## Sites and Siting

In urban areas the community centre should not serve a population greater than 10,000 persons; thus, in large urban areas, a series of centres should be planned, one in each main residential neighbourhood, with a main centre forming part of the town's central buildings or civic centre. In this way neighbourhood buildings will be reasonably close to users and sites will need less close relationship to public transport and less car parking.

The site must be accessible to the whole area it is to serve, and should be grouped with other recreational and social services, sports centres, and with schools, especially if the latter may advantageously be used in conjunction with the community centre. Some advantages, such as economy of buildings, use of gymnasia and availability of specially equipped teaching rooms, may be obtained by grouping community centres with educational buildings, but there is a risk that an unhappy psychological effect may arise from the feeling of a " return to school," especially among young people, if the school buildings themselves are used; in addition, there is the difficulty that schools are not furnished or equipped for adult education and this may prove a great inconvenience, although it will, in a measure, be changed when " Village or County Colleges " envisaged in the Education Act 1944, are built and adequately equipped for semi-adult pupils.

It is an advantage to have a site area that will permit planning of gardens to form a pleasant setting and as an extension of premises for events such as " sales of work " and " fêtes." There are also possible advantages from the grouping of the community centre with communal playing fields, as some of the community buildings, such as the canteen and changing rooms, might be used for dual purposes.

The proximity of water, such as rivers, streams or lakes, adds greatly to the amenities of the surrounding layout and gardens, and such natural assets are valuable when choosing a site.

Figs. 1 and 2 illustrate village centres, which are usually small schemes, on typical sites. The one has a wide frontage and shallow depth, and the other shows a narrow frontage. These figures illustrate the relationship of buildings to street and the arrangement of car-parking facilities. (For parking of vehicles, *see* section on " Garages " while details for cycle storage are given in the sections on " Schools " and " Factory Buildings.") Parking for perambulators will be needed if there is a clinic or the like, such parking must be under cover; *see* under " Pram Sheds " in Part 1: Transport.

The scheme shown in Fig. 1 has the entrance on the side of the hall and a grass space in the front of the building, while the car park occupies the remainder of the site. A small enclosed yard is provided adjoining the kitchen; this is useful for open-air storage and for the screening of any untidiness or approaches to basements and fuel stores. In Fig. 2 the main entrance is

placed at the end of the hall. One side of the hall is used as a parking space and the other as a grass area with approaches from the hall. Hedges are to be preferred to fences, but boundary walls of brick or stone may be used where this is customary. Flower beds, although attractive, necessitate upkeep and are liable to damage if the grounds are at any time crowded. Trees should be preserved whenever possible; tree planting aids the general setting of the buildings so long as care is taken to avoid overshadowing of windows. Yards and main approaches should be paved and properly drained.

The diagrams are not intended to show the proportional areas required for village centre sites but merely the general principles of layout. Larger site areas are desirable in even the smallest schemes.

In larger schemes approach roads and car parks should be carefully separated from gardens and when possible the buildings should screen the one from the other.

Car parking must be placed in such a position that vehicles may drive up to the main entrances, particularly that of the assembly hall and continue without difficult turns and without reversing into car parks.

### Types of Centre

Throughout this section a number of terms is used to describe various sizes of centre, e.g. " village centres " to describe the smallest types, which may be merely small clubs; and in slightly larger villages they are likely to be small halls with a few additional rooms used for a variety of purposes.

" Community centres " is generally applied to types for larger villages, towns and small cities. Similar centres are likely to be used in " neighbourhood " units of large towns and cities and where, in addition, there will probably be a main centre at which the most important functions of the whole urban area will take place.

Village, town or county colleges are not covered in this section, although these may be very closely associated with community centres in many instances, and certain accommodation may be used jointly for both purposes.

The term " youth centre " is also used where it is desired to distinguish parts of centres or whole centres

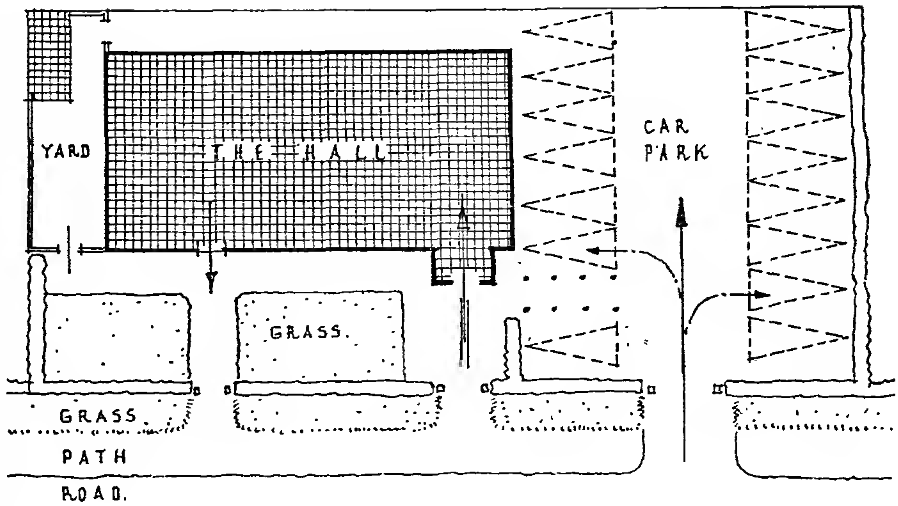



Fig. 1 Site layout

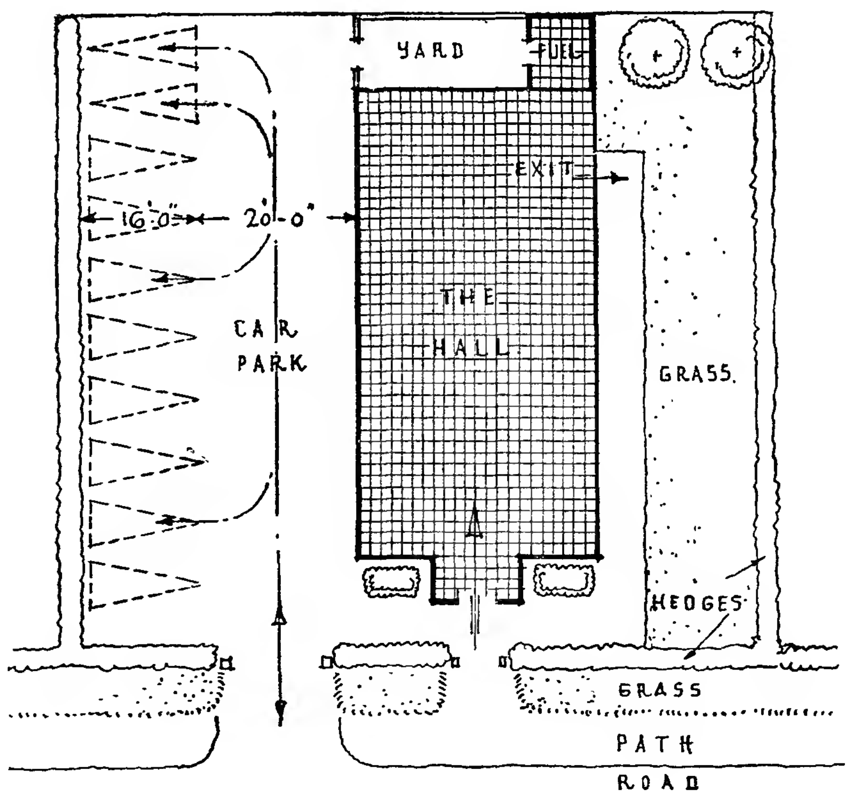



Fig. 2 Site layout

devoted to young people's activities from those used by the main adult population of an area or unit.

### Activities

These fall into three main groups, although each tends to be closely related to the whole and many fall within two groups. The main groups are social, recreational and educational. The social group includes activities such as dances, whist drives, concerts, dramatic performances, together with simple club and common room facilities; the recreational group covers activities such as physical training, badminton, table tennis and various clubs, such as poultry and allotments; the educational group provides for reading and for classes ranging from cookery and carpentry to economics and languages. It is usual to consider all the activities in relation to age groups, as some only interest the young while others draw members of all ages; it may be necessary in some schemes to plan the buildings in two or more groups, thus separating youth activities from general activities.

Centres may include a library, which will often be a branch of the town or county library organization; also, it may be a convenience to incorporate a clinic as part of the buildings, for mothers and infant welfare, or even for entire family medical welfare.

A canteen is of great value, not only for refreshments on special social occasions, but also for daily use in connection with all the activities; it should be adequate for serving light meals, and not only " tea and cakes," except in the small village centres, where daily use may not be possible.

Accommodation is needed for the staff and will be dependent on the number and type of staff employed; in many schemes the staff may be little more than a warden and a caretaker, with the possible addition of a steward; other schemes may need a large number of staff of varying types, whereas the small schemes can probably manage to support little more than the part-time services of a caretaker. It can, however, be generally assumed that, except in very large schemes with resident wardens or caretakers, the various types of staff employed will be non-resident or part-time and that living accommodation is not required.

### General Layout

The types fall into two groups. Firstly, the type that consists principally of a large hall, with one or two rooms only attached to it. Secondly, the type in which the main hall or halls are only a part of the total scheme.

Fig. 3 illustrates a number of diagrammatic layouts of village or semi-rural centres, with varying numbers and types of rooms attached. Occasionally a hall is built without additional rooms, as shown in Type A; it may serve a small rural area, principally as a village club, but the provision of at least one additional room, as in Type B, makes a centre doubly useful. Theatrical performances are impossible without the extra accommodation. Type B is without cloakrooms at the entrance, but has a large committee or common room at the back of the platform, with lavatory facilities attached. Type C has the committee room shown in Type B divided into two rooms, each with lavatory attached and thus provides for two organizations to use the building at one time, or provides a dressing room for each sex. Kitchen facilities on a small scale are useful in one of the two rooms. Type D has three rooms behind the stage, one of which is used as a kitchen, leaving the other two as committee or dressing rooms; this arrangement of rooms is specially useful, as the kitchen may be used in conjunction with the hall, or either of the other two rooms, without disturbance to other rooms. It is not pleasant or convenient to have the kitchen equipment placed in a room frequently used for other purposes.

The type shown in Diagram D should normally be considered as the minimum accommodation desirable in even a small community. Type E shows a larger scheme with cloakrooms provided at the entrance to the hall without lavatory accommodation. This arrangement is usually adopted for cheapness and is not as efficient as that shown in Type G, where the two cloakrooms, each with a lavatory, serve the two sexes. However, E is adequate for many local uses, as frequently the retiring or committee rooms behind the platform are not in use at the same time as the main hall, for example, when dances are held and one of the rooms behind the platform is used as an additional cloakroom. Type E has also two retiring rooms leading from the committee or common room, which may then become the " green room " and scenery store for theatrical performances and at other times may be used for separate organizations such as for scouts, the library, etc. Adjoining the kitchen in this scheme is an additional room, which may be used either as an extra committee room or for a special purpose such as a workshop for teaching handicraft work, or as a clinic, when it could be suitably fitted up for the purpose.

In Type F the two dressing rooms are separate, unlike those in Type E, which makes them more useful as general purpose rooms than when approach is by way of the main committee room. The whole layout is simpler than Type E, which is, in consequence, a more expensive building.

Type G shows the addition of a large room to the scheme and is therefore more or less a combination of Types E and F. Such a room might be used for billiards or as a general games room. Type G also shows the full cloakroom, lavatory and vestibule needs at the entrance to the hall. If required, a cinematograph or lantern projection room can be planned over the vestibule, with a staircase leading to it and used also as an escape.

In all the types of Fig. 3 the hall may be used for many purposes, such as dramatic performances, dances, a gymnasium, or a general club room; it might also be subdivided by means of screens or folding partitions into two smaller rooms approached from each end of the building, although at times this arrangement may prove to be inconvenient. The smaller rooms in all schemes are used for a wide variety of purposes, such as small club rooms, as dressing rooms for theatrical performances, committee rooms or consulting rooms, and if the building is used for maternity or infant welfare the main hall may have to serve as a club room and waiting room.

Fig. 4 shows an analysis of larger types in which the halls become relatively less important than the rest of the accommodation, and in fact, if the community centre is grouped with a school, it may be possible to avoid the expense of the provision of the main hall and concentrate on the provision of a smaller hall, which would be adequate for larger club meetings, although inadequate for large meetings or social events. In the schemes indicated on

## GENERAL LAYOUT

Figs. 3 and 4 there is no reason why portions of the buildings should not be two storeys in height, especially as the hall needs to be reasonably high for a suitable stage construction or for indoor games such as badminton, or if a gymnasium is provided, as this also needs a height permitting two storeys for other rooms.

Care should be taken that small rooms are of adequate size for the purposes intended, especially if space is occupied by cupboards or lockers for each club or group using the room.

Fig. 5 illustrates the essential relationships of a large community centre for a population of from 5,000 to 10,000 persons. The scheme is based on two entrances; one serving the whole building and the other leading directly to the halls, as it is essential to arrange that as many parts of the group as possible can be used simultaneously. It should be noted that the cycle and perambulator stores are related to the main entrance of the building, whereas the car-park is more closely associated with the entrance to the halls.

Related to the main entrance are generally cloakrooms for both sexes; a separate group is allotted for the use of visitors to the halls. Associated also with the main entrance are the rooms most generally used, such as the common room, library and reading room and general-purpose rooms. The warden's office should also be near the entrance, but his quarters, if he is resident, may be on an upper floor. The games and group activity rooms are planned together with such small rooms as may be needed for " leaders." Teaching rooms should be grouped together and, except for craft rooms, such as carpenters' shops, may be planned, if required, on upper floors; care should be taken when placing teaching rooms to avoid positions where noise from games rooms may be disturbing. The gymnasium with its changing rooms may be and is generally better treated as an independent unit.

The kitchen and canteen should be so planned that it serves as directly as possible both the common room and the main hall. The main hall, although often treated as a semi-independent unit, should be accessible from the remainder of the buildings under cover. The small hall may either be associated with the main hall or form part of the other accommodation of the whole group.

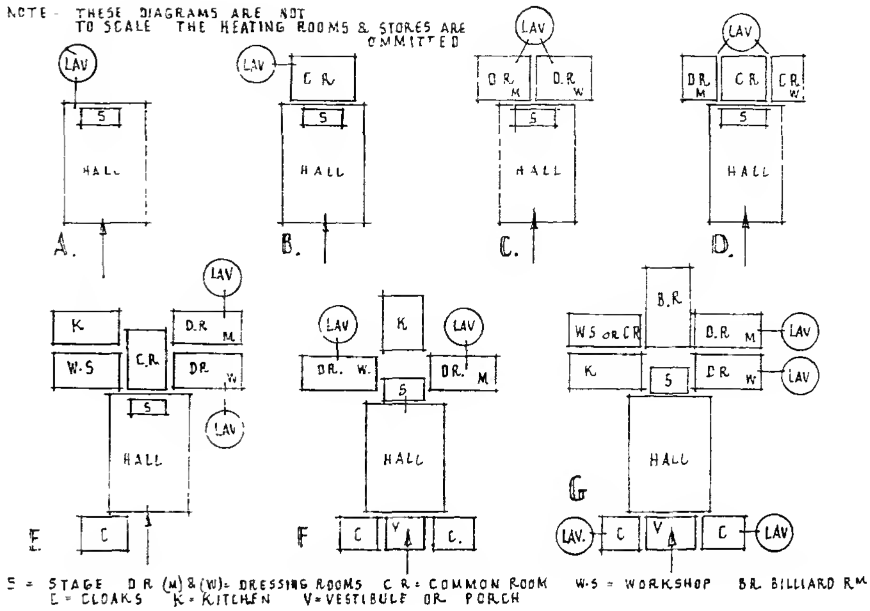



Fig. 3 Diagrammatic type plans

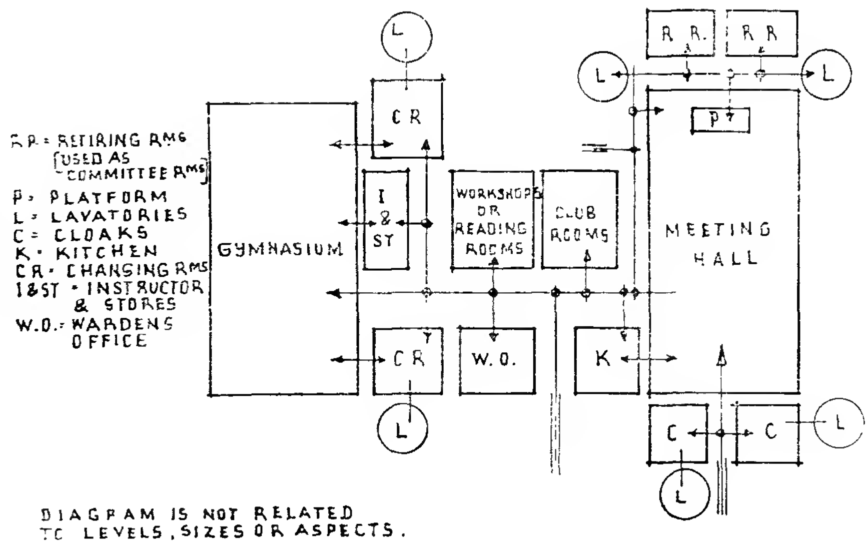



Fig. 4 Plan analysis (a medium-sized type)

**Future Extensions**

It is of great importance that community centres should be so planned that future extensions may easily be made, as the money available at the commencement of schemes is likely to be limited and moreover, as the centre increases in popularity, many more activities may need accommodation.

Plans may be adopted whereby future extensions are made easy, more particularly, in bigger schemes, those which produce ultimately a courtyard plan type as illustrated in Fig. 6.

Walls of single-storey buildings can also be constructed so that one or more additional floors may be added, but in order that this may be possible consideration should be given to the placing of future staircases in positions which will not spoil initial planning, or make ultimate circulation difficult. It is, however, generally agreed that horizontal extensions are better and less disorganizing than vertical extensions.

Fig. 6 illustrates two plan arrangements on which future extensions are indicated. Type A is based on forming an open courtyard scheme when the buildings are completed, whereas Type B has an enclosed courtyard. Both examples suggest that a main hall and a few rooms form the basis of the scheme in its first stages, but it may be considered that other activities are of greater importance when the scheme is commenced, or alternatively a hall may be available in an adjoining building, such as a school and, therefore, the large hall will be better provided as part of the future extension. Car parking should be arranged in such a position that the area is not too small for use when the extensions have been carried out.

Both schemes shown are capable of further extension than is suggested on the figure, by the addition of wings projecting on each side if the site area permits.

Future extensions affect the planning of the first portion of the building very much and a future extended scheme should be drawn up in outline before any preliminary building decision is made.

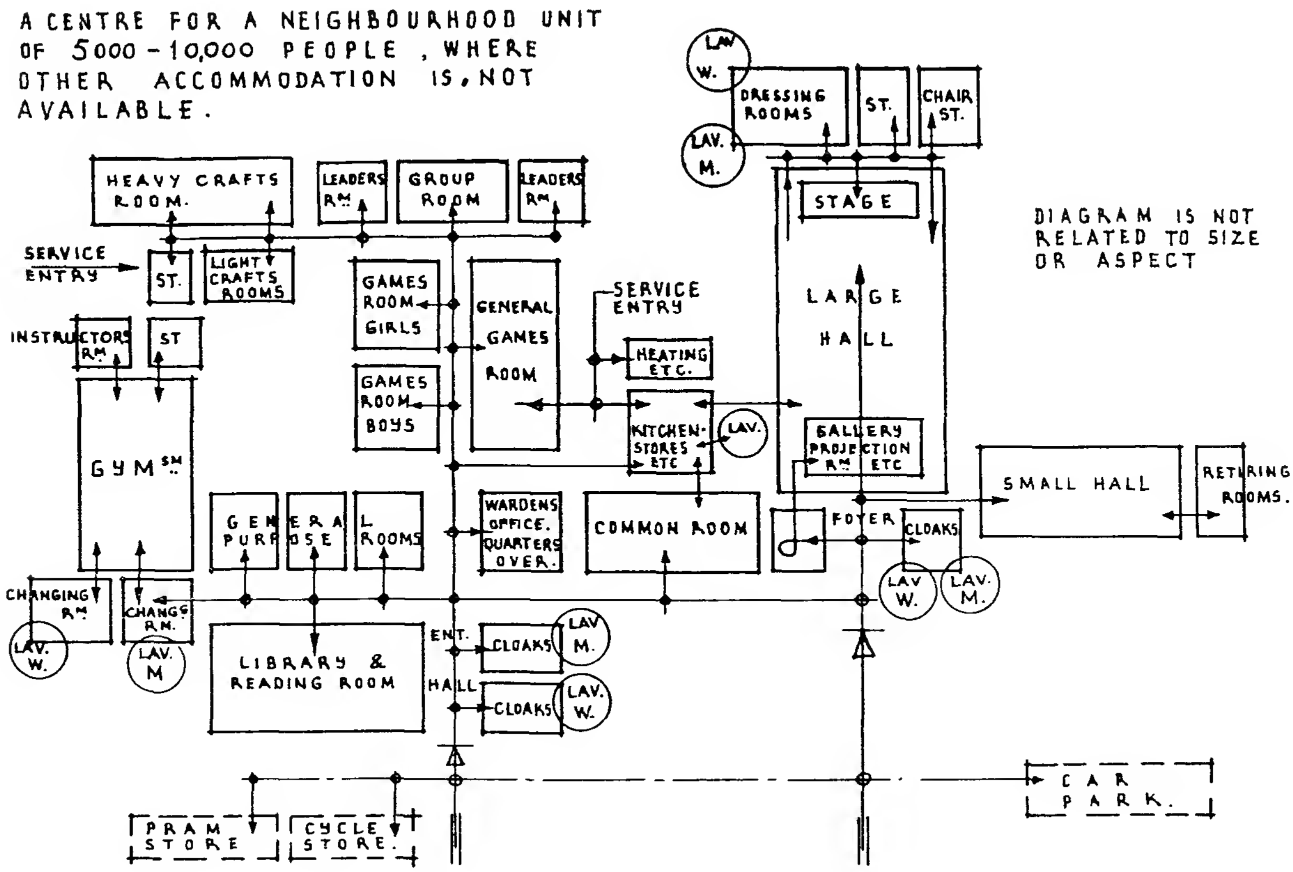



Fig. 5 Analysis of plan types

**Entrances**

In smaller schemes the main entrance usually leads directly to the hall, with a subsidiary entrance to the group of small rooms frequently planned at the opposite end to the main entrance. Emergency exits will be referred to below.

In larger schemes the main entrance will generally lead to the club rooms, classrooms, and other general rooms, with a separate main external approach to the hall, so that this may be used as an independent unit without disturbance to the remainder of the building. If a separate youth group is planned, this also may need a separate entrance. It is advantageous to plan a service entrance for delivery of fuel, removal of refuse and access to the kitchen, if this is large.

Entrances should be generous in area, and should be related to the various accommodation in such a way as to reduce cross-circulation and internal access corridors to a minimum. Main vertical circulation for buildings having two or more stories should be planned near the main entrance. Entrances should lead as directly as possible to general club rooms and to the lending library if one is provided. The warden's rooms should be near the entrance. Two sets of doors should be planned at the entrance, the outer set being normally open and the inner a pair of swing doors. Main doors should not be less than 4ft. 6in. in the clear. Adequate mat-wells should be planned at all entrances. Efficient heating at entrances is of importance. An ample notice board in a position easily visible to all entering the building and in a sufficient space for readers to stand clear of main circulation is essential.

Fig. 7 illustrates two typical entrances to small halls. Type A is suitable for very small schemes, and Type B for halls seating about 250 persons. Cloakrooms should be cut off from the halls, thus they form a crush lobby within the entrance doors and may well have lavatory accommodation attached. The latter is desirable in all schemes, but its cost, together with extra drainage, frequently causes relegation to the stage and kitchen end of the hall only, in small schemes. Type A of Fig. 7 simply uses recesses at each side of the door lobby and has the objection that wet clothes are in fact stored in the hall itself. Type B not only more or less screens the cloak space from the hall and may be curtained off, but also provides for access to a small projection room over the entrance.

**Entrance Details**

Fig. 8 illustrates a typical entrance to a large hall planned as a separate, though connected, unit of a community centre. In this example two doors lead past the ticket office in a crush space to the hall itself. The ticket office is placed so as to be in full view of all as they enter and also permits full supervision of the entrance doors; it is advantageous if the ticket office is slightly set back so that those waiting do not interrupt people with tickets passing to the hall. Cloakrooms are closely associated and each has its own lavatory leading directly from it. Adequate lengths of counter space should be provided in the cloakrooms. It should be noted that a corridor, cut off by a door, leads to the remainder of the community buildings. The staircase to the gallery can be reached after passing the ticket office.

The outer entrance doors, which will be open when the building is in use, fold back to permit free passage but inner doors are of the double-swing type. It is desirable to plan the openings or doors to cloakrooms and staircases in such a way that they are not hidden or involve turning back after entering the crush hall.

Fig. 9 shows a typical general entrance to a large community building. Since the number of persons entering may at times be large, very generous space should be allowed for the hall space itself; it is desirable to provide seating for visitors waiting. In this example the cloakroom with its counter is planned on one side of the entrance doors immediately on entering the building, while the warden's office is placed opposite. Notice boards are given very prominent positions, easily seen by all who enter the building, and ample space is provided around them so that normal traffic is not disturbed by readers standing at them. Lavatories for each sex are planned off the main entrance on either side and just beyond corridors leading to the main public rooms. The staircase leading to upper floors is placed on the wall opposite the entrance doors and an adjoining central corridor leads to craft rooms and the youth centre.

**Cloakrooms and Sanitary Accommodation**

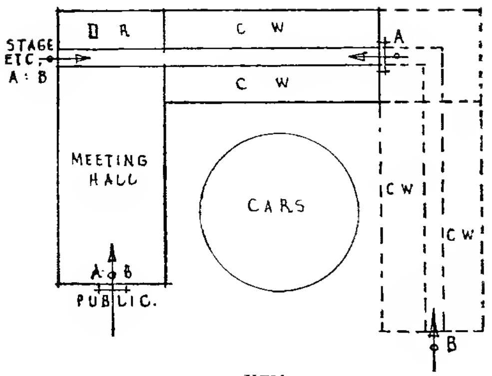
Cloakrooms and sanitary accommodation for each sex should be provided independently for the community centre and for the main hall. Cloakrooms for the community buildings should be as for secondary schools. In large community centres it may be desirable to have the cloakrooms under control, but normally open rooms will be found satisfactory. Cloakroom layouts may be based on the use of coat-hangers, placed at 4in. centres. The space occupied when hangers are used is approximately 2ft. with ganways not less than 4ft. wide if hangers are placed on both sides; if, however, cloakrooms are controlled by attendants, gangway spaces may be reduced to 2ft. 6in.

Cloakrooms, when attached to main halls, should cater for the number of persons who can use the hall for dancing; for almost all other uses of the hall the amount of clothing deposited in cloakrooms is likely to be much less. Cloakrooms attached to large halls should be controlled by attendants and have long counters.

The amount of sanitary accommodation for community centres does not seem to have been prescribed, but a slightly more generous allowance than that given in the section on "Factory Buildings," should meet adequately the needs of the occupants; it is doubtful if allowances as large as those laid down for secondary schools are justifiable.

The main hall should be provided with independent sanitary accommodation and this should be based on the requirements of the licensing authority, which are somewhat variable; general guidance to these requirements is given in Part 1: Sanitation.

## PLANNING FOR EXTENSION, ENTRANCES




KEY

A—entrances: 1st portion

B—entrances: completion

C.W.—club rooms, workshops, etc.

C.R. & D.R.—changing rooms, dressing rooms, etc.

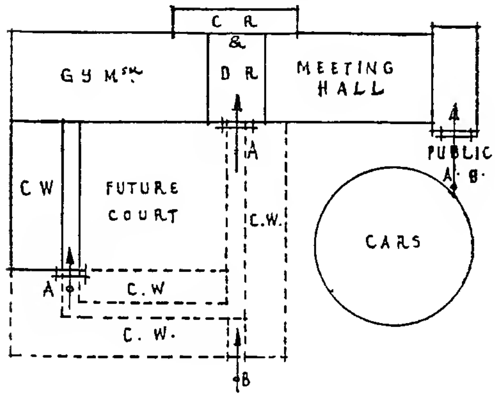
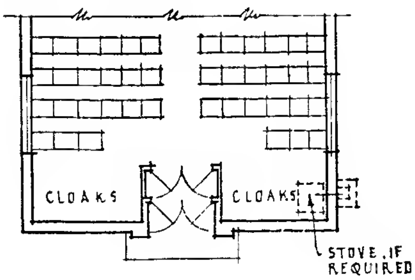
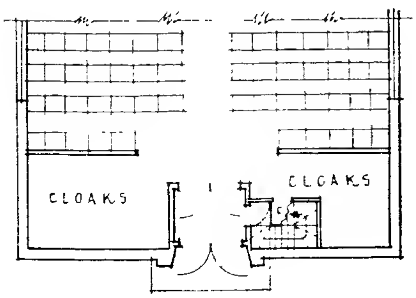



Fig. 6 Planning for extension




A




B

Fig. 7 Planning the entrance

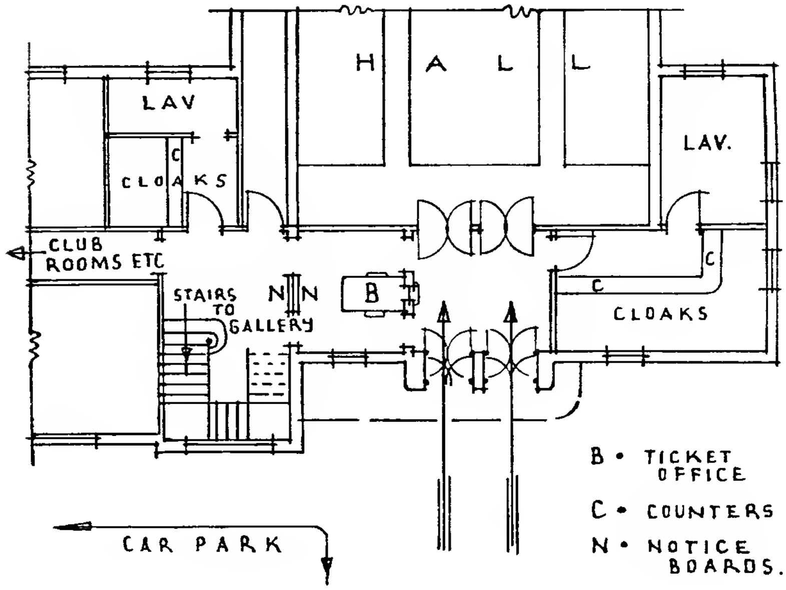



Fig. 8 Typical entrance to large hall: urban

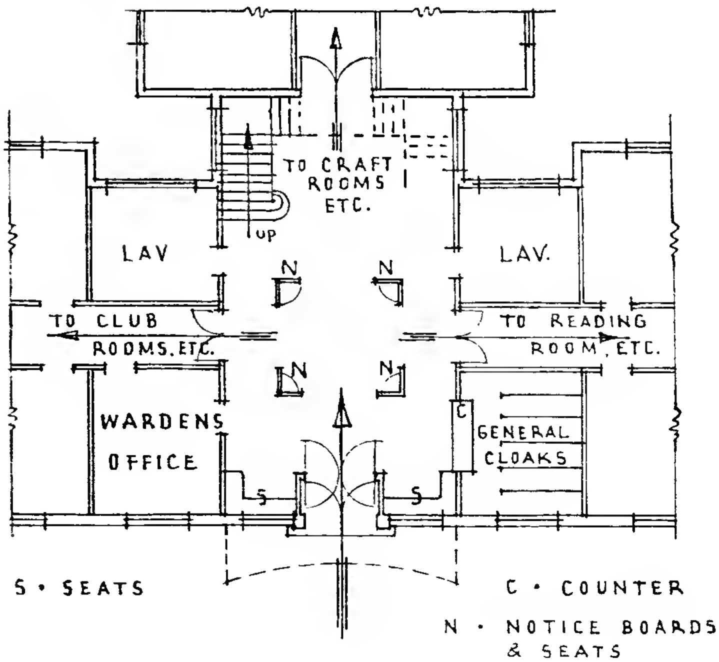



Fig. 9 Typical entrance to large group

### The Hall

If the community centre is planned in conjunction with a school, the hall may be eliminated if arrangements can be made for use of the school hall, although in fact this may have great disadvantages.

In small villages, with populations of up to 300 persons, a hall of 400sq. ft. to 500sq. ft. area divisible into two rooms will probably be adequate. In larger villages having up to 500 population, seating for about 120 persons seems to be a fairly common requirement and can be provided in a small hall about 45ft. by 20ft., including the stage. If the population is between 500 and 1,500 a hall to seat 300 to 400 persons will usually be needed. It must, therefore, have an area of 1,500sq. ft. to 2,000sq. ft.

It should be noted that a badminton court, as shown in Fig. 10, needs at least a floor space of 54ft. and is better 60ft. long by 26ft. wide, exclusive of a stage; this area provides seating for about 300 persons. A hall to be used for badminton needs to be at least 11ft. high at the edges of the court and 15ft. 6in. at the centre; thus the roof springing should be at not less than 11ft. or, if flat, the ceiling must provide an overall height of 15ft. 6in.

Where the population exceeds 2,000 the hall will probably need to be about 2,500sq. ft. to 3,000sq. ft. in area. In towns and neighbourhood units having populations of 3,000 and upwards, it may be desirable to provide two halls, one about 3,000sq. ft. in area for large functions, together with a small hall of about 600sq. ft. to 700sq. ft. for more intimate uses such as lectures, debates and club meetings for which the main hall will be unnecessarily large and the stage probably unsuitable.

Seating for halls should be based on an allowance of at least 5sq. ft. per person, but this will be found in practice to be rather small after the deduction of gangways, and it will be found that an allowance of 6sq. ft. per person is much more satisfactory for general purposes. Gangways should be at least 3ft. 6in. wide and more should be allowed for main gangways in larger halls.

Fig. 11 gives in diagrammatic form the space needed for various uses to which the stage and the floor of a hall may be put; these approximate areas allow for normal gangways as for dinners, seated audiences, etc.

Chairs are usually provided in halls, and consideration should be given to those of a strong nesting type and light in weight, as the hall may have to be cleared frequently if used for a variety of purposes. In halls with a large seating capacity and used for licensed purposes (music, dancing, etc.) provision will often have to be made to meet the demands of the licensing authority for fixing together of chairs in the rows; also, in some instances the fixing of at least the end chairs adjoining gangways; such requirements can be met without undue difficulty.

Halls should generally be rectangular and the length should be about twice the width, exclusive of the stage, but great length in proportion to width should be avoided for reasons of acoustics.

It is usual to plan the main entrance at the end opposite to the stage or through a side wall close to the back wall, with the emergency exit or exits placed near the stage on the side walls. Exits beyond or behind the stage are not readily accessible from the hall, as the stage generally takes up the whole or almost the whole width of the room, especially in smaller halls. All halls should have two exits and those holding more than 200 persons should have two exits each 4ft. wide in the clear, with doors opening outwards.

In smaller halls a single central gangway provides the most economical and convenient layout, but in larger halls more gangways are needed; seats should not be more than seven from a gangway, thus limiting the number in a row to thirteen.

It is usual to provide a gangway at the front adjoining the stage of at least 4ft. width and a similar (or greater) space behind the last row to give circulation and waiting space, especially if the entrance vestibule is small. Additional information on halls is given in the section on " Schools " and under Assembly Halls in the section on " Municipal Buildings."

When open types of pitched roofs are used for small halls the height need not be very great, and 8ft. 6in. to the springing of the roof is sufficient unless used for badminton. Larger halls need higher ceilings related to the stage and a minimum of 12ft. will usually be found desirable. If flat roofs or flat or flat-pitched ceilings are used even the smallest hall should have a height of not less than 11ft., floor to ceiling. It is, however, unwise to make the height greater than the width or over about 28ft. It is desirable that the greater part of the ceiling should be flat to assist acoustics, although, for economy, in small halls open types of roof are often adopted.

Fig. 12 illustrates typical sections for small halls. Types A and B are the simplest, having an open roof pitched from about 8ft. 6in. above the floor. The two pitches indicated are dependent mainly on the roof covering adopted. These sections can have a ceiling at the level of the collar beams, but with the flatter pitches the room might seem too low. Types C and D are pitched from a greater height above the floor with a ceiling at collar height. Steep pitched roofs permit the introduction of high side-lighting by means of dormer or semi-dormer windows, thus leaving ample wall space. Large wall surfaces are useful for hanging pictures, for stalls which may be erected for " sales of work " and for gymnastic apparatus. If the hall is to be used as a gymnasium, strengthening of the roof may be needed to carry suspended equipment.

Type E shows another form of open roof in which the small portion at the apex may be ceiled in. For the use of a high-pitched roof of this type less outside wall is needed, but it is probable that the acoustics will not be very satisfactory. Type F is also an open-roof type, with walls reduced to a minimum height.

Types G and H have curved ceilings suspended from the trusses or timbering of high- or low-pitched roofs. The centres from which curves of ceilings are struck must be below the floor level, or, if the halls are very high, they may be placed well above head height, to ensure good acoustic properties for the hall.

Type J is fairly common where a ceiling is required and from an acoustic point of view the faceted ceiling is satisfactory. If the roof is pitched at a reasonable height and is itself of a moderate slope, the shape is an economic one.

Typical larger halls are given in Figs. 47 and 48 in the section on " Schools."

Flat roofs are probably not very satisfactory for smaller types of hall, but may be useful for largest types of building. Apart from the question of suitability for the average village environment, and the possibility of ease of local construction (village craftsmen or small builders), it is doubtful if the

use of flat roofs is economic on account of the average span required (upwards of 26ft.) and by reason of the extra height of ceiling necessary to obtain reasonable internal height. This last consideration especially arises if the hall is required for the use of a badminton club, or as a gymnasium. In larger types of hall, however, in the more urban areas, these considerations are of much less importance.

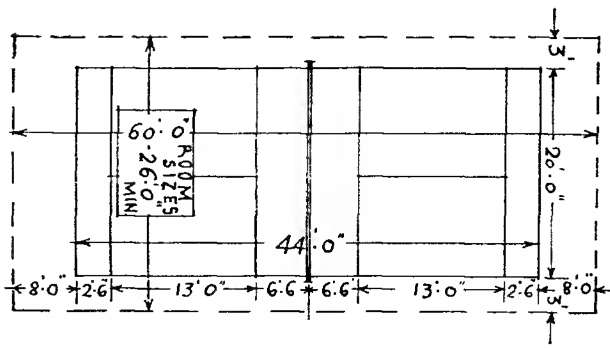



Fig. 10 Badminton court (doubles)

### Galleries

Galleries may be required in large halls as a means of increasing seating capacity. The essential factors affecting the design of galleries, the stepping of the seating and sight-lines are given under Assembly Halls in the section on " Municipal Buildings."

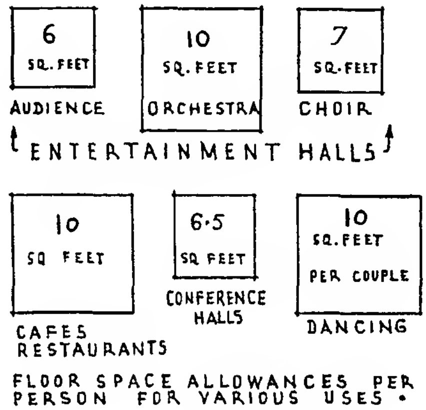



Fig. 11 Floor space allowances per person for various uses

### Escape

Means of escape must be borne in mind in the planning of all doorways and staircases and more especially exit doorways; means of escape are controlled by the licensing authority and tend to vary a little between different areas; general guiding information is given in the sections on " Schools " and " Municipal Buildings."

### The Stage

A permanent stage is a necessity for almost every use to which halls may be put and, though it need not be large, must be capable of extension to the full width of the hall. The stage should be level and not ramped, except possibly in very large halls to be used exclusively for theatrical purposes.

The height of the stage above the floor must vary according to the length of the hall from the front of the stage, as shown in Fig. 13. 4ft. is about the maximum height necessary, however long the hall may be. The projection of the permanent stage from the back wall should vary with the size of the hall, but less than 10ft. will not accommodate with comfort several speakers and a table, while 12ft. is a more satisfactory depth; for larger halls, especially if used for dramatic performances, at least 20ft. depth is desirable and preferably more.

In small halls without a permanent proscenium it is wise to place a truss or

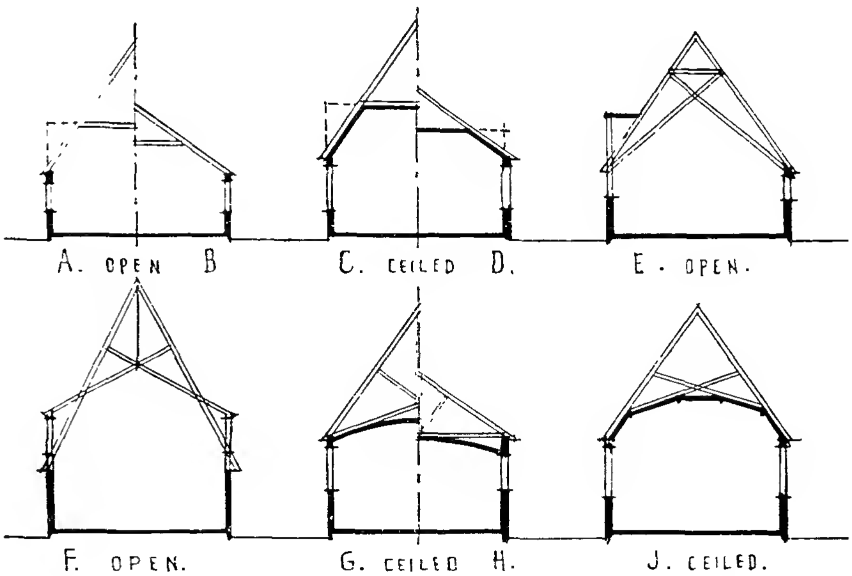



Fig. 12 The section and roof

tie-beam at the front of the stage from which to hang the front curtain; such an arrangement saves much work and trouble in fitting up temporary curtains and screens. In larger halls a permanent proscenium should always be constructed. The proscenium opening should be at least 20ft. wide and more in wide and large halls; the height of the opening above the stage should be not less than 12ft. At least 4ft. space is essential on each side of the stage opening for wing space. The permanent platform can often be so constructed as to form a useful storage space underneath it, where chairs may be placed when the hall is to be used for such purposes as dances. In small halls, however, it may be desirable to have the stage entirely removable, in which case it may be constructed of stout trestles or even tables of convenient size for moving in and out of the doors of the hall. Trestle types of table are not generally satisfactory, as they creak too badly and are frequently not strong enough for dancing or for dramatic performances. An extension or apron stage, formed of removable units having 3ft. or 4ft. projection from the normal stage front, is a very valuable addition, but this must be carefully borne in mind when planning the stage lighting, as this space cannot be covered from any light source placed behind the proscenium. In all halls everything behind the stage front should be at the same level as the stage to avoid steps.

Access to the stage from the hall itself is often needed; it may be made by movable steps placed either at the front or sides of the platform, according to the varied uses of the hall. A handrail is desirable to these steps, whether fixed or movable, unless enclosed on both sides, for the use of old or very young people. When access is provided from hall to back-stage, pass doors should be planned near the outside walls and as far from the proscenium opening as possible. Steps to stage level should be planned behind the proscenium front but, to avoid danger in the wings, it is wise to have a cover for these steps to form a level area.

At stage level, the curtain should be near the edge of the permanent stage and any fore-stage erected temporarily for theatrical performances should not project too far beyond the curtain. The curtain should not be placed at the front of the fore-stage, as it and the beam from which it is supported, or the proscenium, if any, may be disturbing elements acoustically.

Fig. 14 illustrates typical plans of stage arrangements for small halls. Type A is suitable for the smallest type of hall where a small permanent stage has movable side additions for use during theatrical or similar performances. By limitation of the width of the permanent stage and by the introduction of side extensions when a full-width stage is needed, which is not very frequently, clear passage-ways at normal floor level may be provided between the hall and the back rooms; this obviates going up and down two sets of stairs to reach the hall from the rooms behind the stage. Care must be taken to place flights of stairs sufficiently far away from doorways to give adequate head room; alternatively, the heads of the doors should be raised above normal height. In Type A the steps to the permanent stage are in such a position that they do not interrupt side passage-ways and may easily be covered when a full stage is needed. Additional temporary steps may be placed at the front of the stage when specially required.

Type B shows another scheme for small halls in which the permanent stage occupies the full width of the hall. As there are no side passage-ways, the floors of the rooms behind the stage are all raised to stage level. In this example, the stage may be cut off from the hall for use as an extra room by means of two large doors which fill the proscenium opening. This is built as a permanent structure across the full width of the hall and has two small doors for access to the steps leading from the hall to the stage. The extra room thus formed by using the stage is very useful as a reading room or club room, especially when a fireplace is provided as indicated; this fireplace may also be useful as a background for theatrical productions. Type C shows a larger hall with a permanent stage space to allow side passage-ways between the back rooms and the hall, and also indicates the placing of six equal-sized temporary additional units for enlarging the stage for theatrical performances. Three of these units form the apron stage, two fill the side passage-ways, leaving a space for the access steps to the stage and the remaining unit is placed behind a door in the centre of the back of the stage for use in connection with scenery storage or as a "vista stage." The curtain in this example is at the front of the permanent stage and has an extension to fill the side passage-ways when required. Alternatively, a temporary proscenium may be used in its place. A temporary proscenium is much more satisfactory than curtains for such performances, as it is difficult with the latter to exclude stage lighting from the audience. Opinions vary as to permanent prosceniums in small halls, they are considered to be inconvenient for many uses, particularly when access from hall to stage is necessary.

Fig. 15 illustrates in Diagram A a scheme for small halls and village clubs in which the hall serves as a church or chapel for occasional use. A small sanctuary is placed behind the permanent stage and divided from it by a folding screen. The sanctuary must have sufficient depth for the altar itself, room for the priest between it and the altar rail and space for the folding screen to move. The sanctuary is raised one step above normal level of the stage, which has permanent access steps on each side, the projection of which forms the apron. A small room, serving as a vestry, is provided with direct access to the sanctuary behind the folding screen and is entirely cut off from the stage.

Diagram B of Fig. 15 shows a more elaborate stage which involves more cost, with more elaborate stage-lighting. A permanent proscenium divides the hall from the stage, in front of which is an apron stage, flanked by steps and doorways giving access to stage level. On the stage is placed a plaster-faced background or cyclorama for stage settings and to assist acoustics; it can also serve as a screen for cinematograph or lantern productions. Between this and the front curtain are arranged two curtains on suspended tracks which may be moved to form side or back screens, leaving central or side entrances. This provides a very adaptable background serving all purposes for which a small stage may be required. In such a scheme with permanent curtains, windows on the side walls of the stage should be kept small and in such positions that they will be screened from the audience; efficient means of darkening these windows are essential. Walls at the back of any type of stage may advantageously be finished in hard white plaster to serve as a screen for lantern or cinematograph purposes.

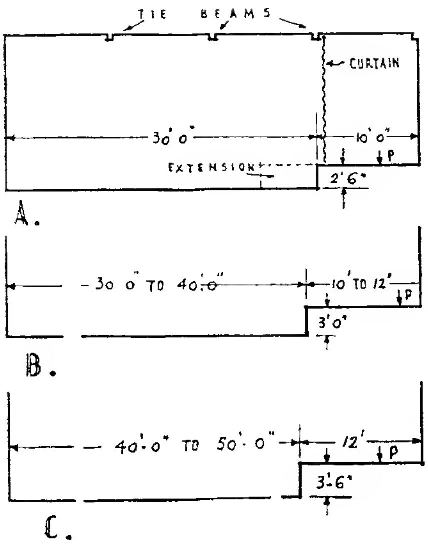



Fig. 13 Long section of hall

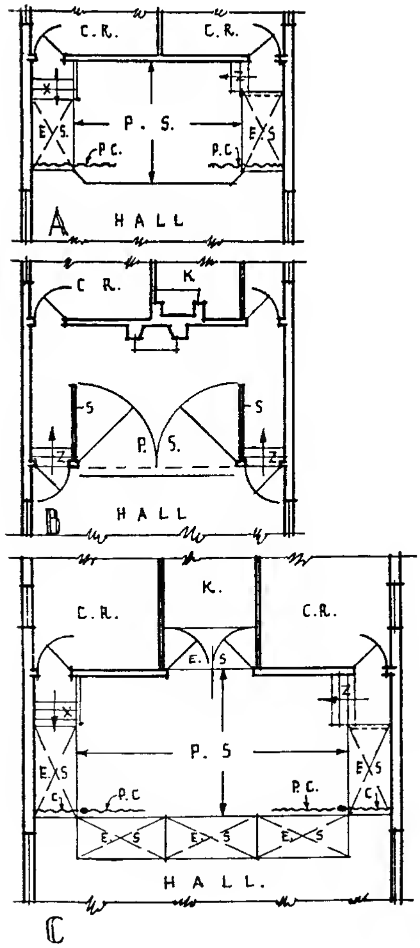



Fig. 14 The platform

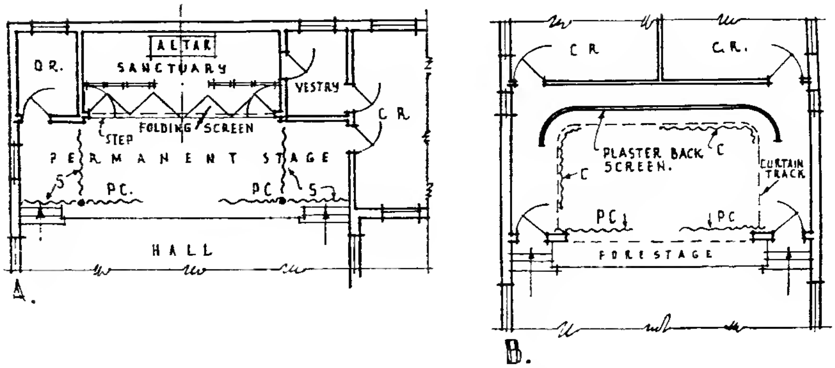
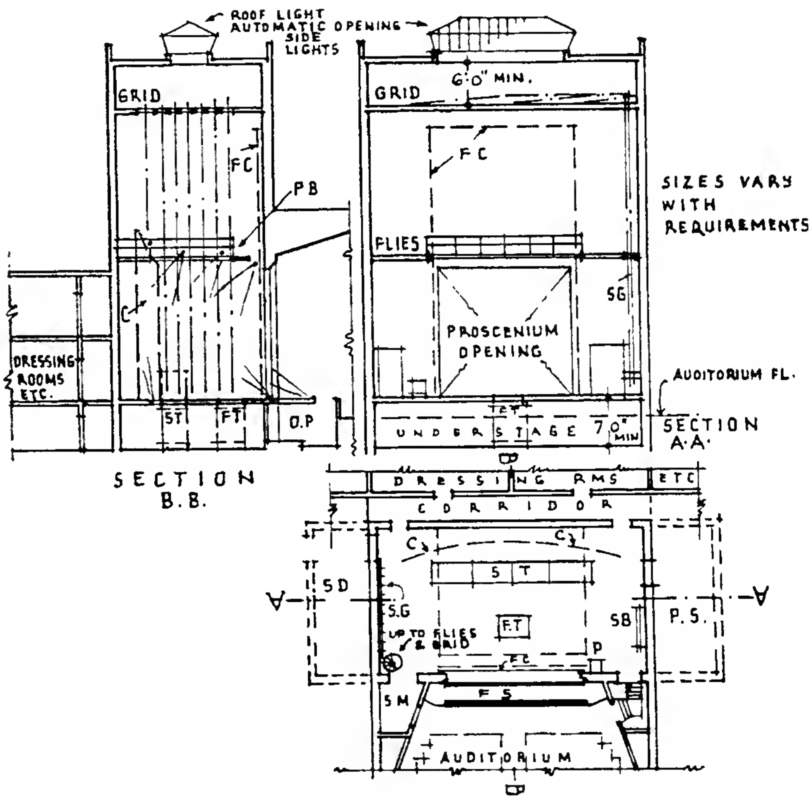



Fig. 15 Stage arrangements: A, a combined stage and chapel sanctuary; B, a permanent stage with adaptable curtains, etc.




KEY

S—temporary curtains or scenery
C—curtains
K—kitchen (green room)
X—temporary steps
S—screen
FC—fire curtain
O.P.—orchestra pit
S T—scene traps
F.S.—fore-stage (removable if required)
P—prompt desk
C—cyclorama (fixed or moving as required)
P.C.—proscenium curtains
C.R.—committee rooms (dressing rooms)
P.S.—permanent stage
Z—permanent steps
P—permanent platform
P.B.—proscenium bridge
F.T.—front trap
SG—scenery guides
SB—switchboard
SD—scene dock (access to street)
P.S.—property store
S.M.—stage manager

Fig. 16 Essential parts of a stage

## STAGES, LIGHTING, GRAMOPHONES

Fig. 16 illustrates an example of a large stage suitable for the main hall of a neighbourhood centre. When a large and fully equipped stage has to be planned additional accommodation becomes necessary, such as carpenters', and electricians' shops, and under-stage space. Sufficient height over the stage for the grid and for flying scenery may also be required. Additional fire precautions usually include a fire curtain and fire-resisting walls to separate stage from auditorium; also roof-lights having automatic opening side-lights operated by means of fusible links, and thoroughly adequate escape facilities for all users of the stage part of the " house."

The equipment for handling scenery must be more elaborate, as also must be the lighting installation, including facilities for flood-lighting the stage from the auditorium.

Fig. 16 gives general diagrammatic information about larger type of stages; since, however, stages vary much according to the circumstances, precise sizes cannot be given; the height of the grid above the proscenium opening must be rather more than the opening itself and at least 6ft. is needed above the grid as handling space.

It is desirable to have a property store on one side of and adjoining the stage and also a scenery dock, the latter having direct access to the street, with doors of sufficient height and width through which to move large pieces of scenery. The equipment shown includes floor traps, a cyclorama and a fore-stage. It will be noted that the stage is cut off from the remainder of the back-stage accommodation by a corridor from which the dressing rooms are reached; this corridor should be wide enough for performers to use as a waiting space, or additional space should be planned in the form of a green-room.

In community centres for large towns or important areas it may be necessary to provide special stage equipment for concerts and choral singing. It is usual also to make provision for an orchestra in a correctly designed orchestra pit in front of the stage. The orchestra pit should be sunk sufficiently below stage level and often below the floor of the auditorium, to ensure that neither the heads nor the instruments of the players project above the sight-lines from the front row of seats to the floor of the stage, or any permanent footlight installation. There should be at least 7ft. from the stage level to the floor of the orchestra pit. The pit itself should be at least 7ft. 6in. wide and should extend at least for the full width of the proscenium opening, if not the full width of the hall. Part of the pit is sometimes recessed under the front of the stage; here the clear height must be certainly not less than 6ft.

Frequently the front of the orchestra pit is constructed as a load-bearing wall so that an extension to the stage may be carried on this wall for use when the pit is not required, as for example when the stage is used for a concert.

For the accommodation of an orchestra and chorus on the stage it may be necessary to provide removable additions to form stepped tiers; such additions should be formed of units of sizes not unduly difficult to handle with the minimum of labour; at the same time they must provide at each level sufficient space (particularly width) to seat performers without discomfort to adjoining performers, especially instrumentalists.

### Stage Lighting

In small halls elaborate equipment is not necessary but for large halls, in many instances, fairly comprehensive lighting facilities may be needed. In smaller halls provision should be made for at least 20 amperes with a master-switch capable of the full load; a small switch-board, from which all lights, including those of the hall, may be controlled should be planned on the stage. Larger halls should be provided with 30 amperes to 40 amperes and very large types, except those with specially elaborate equipment, with at least 50 amperes. Wiring should allow for three or four separate colours in footlights and battens and for flood- and spot-lights. Care must be taken to provide lighting from the auditorium to light adequately the apron stage or very near the footlights and this is usually met by the installation of floodlights on the side or back walls of the hall. Even in small halls with simple equipment the lighting battens should be removable or be capable of being lifted to the ceiling, and footlights should be removable. Ordinary lighting units should be installed to light the stage when used for meetings and purposes other than theatrical uses. There are a number of books on the subject of stage lighting, especially from the point of view of smaller halls requiring less elaborate equipment, in which are detailed more precise requirements than it is possible to include under general planning. Large schemes may need the advice of a specialist consultant.

### Hall Lighting

Good daylight is important, as halls may be used in daytime as well as at night. Lighting for both day and night should be designed to make the room pleasantly and evenly lighted. It is important that easy control of artificial lighting be provided both from the stage and from any projection room that may be installed. The amount of artificial lighting should be such as will provide 6 to 10 lumens at 2ft. 9in. above the floor, which is sufficient to be able to read fairly comfortably and generally to light exhibits or stalls placed in the hall from time to time. Facilities for darkening the room in daytime should always be installed, as additions for this purpose after completion are often unsightly and unsatisfactory. Similarly, if electricity is not available at the time of building, provision should be made to avoid surface and similar systems having to be installed at some later date. Care should be taken to use fittings which will not obstruct the beam from a projector at the back of the hall and special thought must be given to the placing and design of the fittings if the hall is to be used for purposes such as badminton or gymnastics.

In all schemes provision must be made for an emergency lighting system by means other than the main lighting source.

### Gramophones and Amplifiers

It is advantageous to equip all halls for the reception of wireless programmes, music amplification and for the playing and amplification of gramophone records. In very small halls a normal type of radiogram may be adequate, but for all larger halls built-in equipment specially designed with wiring from a control room to built-in amplifiers is needed; such equipment needs a permanent position in which

controls, turn-table, etc., may be enclosed and locked. Record storage should be incorporated. The amplifiers should be placed in the ceiling and made as inconspicuous as possible, but easy access should be given to all parts of the installation without undue difficulty. The main control equipment is best placed in one of the wings of the stage, or alternatively with the sound equipment in the projection room if any. Reference should be made to C.P. 327.300—" Sound Distribution Systems," for further guidance.

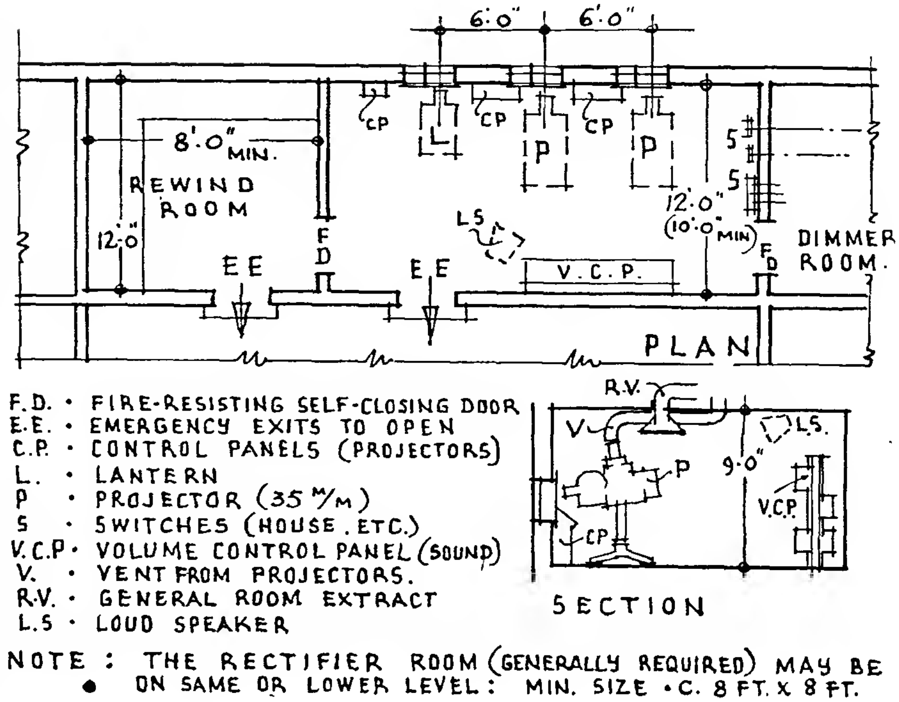



Fig. 17 Typical small projection room

### Cinematograph

Frequently, it is desired to show cinematograph films and, whenever practicable, proper permanent provision should be made for the exhibition of films. The 16mm. non-inflammable types of film may be used with a portable projector standing temporarily in the hall, but for inflammable and all sizes larger than 16mm. film, a fire-resisting enclosure must be used, although for very occasional use in smaller halls this may be a temporary enclosure. It is, however, wiser with the increasing use of films to plan a proper projection room, which can usually be arranged over the entrance and cloakrooms.

A projection room of whatever size must have fire-resisting walls and ceiling and be accessible without entering the main hall. Doors must open outwards and be self-closing and good ventilation is essential. The dimensions necessary for a projection room are at least 6ft. 6in. by 5ft. for one projector and if there is sound equipment this area must be increased; the room must be at least 7ft. high. A separate room adjoining is usually planned for re-winding and this needs a floor space of at least 6ft. by 6ft. For larger and permanent installations to be used frequently more elaborate planning is essential and two projectors are usually provided. Fig. 17 shows the more important features of a typical projection installation for a larger hall. In many schemes it is usual to provide also a lantern for the projection of still pictures, notices, etc. For such an installation the projection room must be at least 10ft. wide from the wall of the auditorium, but with full sound equipment it is better to allow 12ft. Projectors should be at least 6ft. apart centre to centre to provide space for control panels and the operator; thus with the installation shown, including sound equipment, a floor area of 12ft. by 24ft. is desirable, to which should be added a re-winding and film-storage room 8ft. long and of the same width. Space is often needed adjoining the projection room for dimmers for the auditorium lighting, and also space at least 8ft. by 8ft. for rectifiers, although the latter may be on another floor. Both the projector and re-winding rooms must have separate access for escape purposes and the two must be separated by fire-resisting doors. The projection and observation apertures between the projection room and the auditorium must have fire-resisting self-closing shutters which also can be released manually. Ventilation is of great importance both for the room in general and for the actual projectors; considerable heat is generated and should be removed quickly to provide good conditions for the operator.

The projectors should be planned as nearly central as possible on the axis of the hall and with as little rise or fall in the projection lines as possible. Projection rooms with major equipment should be at least 8ft. and preferably 9ft. high to permit the ventilation installation being placed where it will not cause obstruction. Projection rooms are frequently lined with sound-absorbent materials to reduce the noise of the machines to a minimum.

Where films are to be shown regularly a county council licence is needed, and this may necessitate the fixing together of chairs in rows, each having not less than four nor more than ten chairs. Many of the films now available even in the 16mm. size have sound attached, and therefore it is desirable to provide in all halls for the necessary wiring and amplifiers when the hall is built. Controls for the lighting of the hall other than those for the emergency lighting should be placed in the projection room.

### Heating and Ventilation

Some form of heating is essential in all schemes, regardless of size. For very small schemes the halls may be heated with one or more slow-combustion stoves, and additional rooms with similar stoves or open fires; for all larger schemes a more general heating system should be installed. Many types of stove if placed in rooms are inclined to be dirty, rather difficult to control, and are drying to the atmosphere as surfaces tend to become very hot. Various forms of air-heaters have been installed and proved efficient, but for larger schemes a low-pressure hot-water system of some kind becomes essential. When a heating system is installed, all the rooms of the building are heated from one boiler, with a consequent saving in labour and fuel costs. A number of schemes having club or common rooms supplement the central heating system with local units such as open fires or openable stoves, gas or electric heaters, mainly, it seems, for reasons of appearance.

Stoves or radiators should, where possible, be set in recesses. In small schemes where rooms are used intermittently, it may be found that gas or electric radiators, panels or tubular heaters are more economic than a general hot-water system, although it is necessary to maintain some low-temperature heat fairly continuously in order to keep the building and its contents dry and in good condition, with easy control to increase the temperature when the building is in use.

Artificial ventilation is seldom installed, except in larger halls, when mechanical extract fans or a full air-conditioning system may be desirable; windows therefore, should be designed to have ample opening portions, especially near the ceiling, and should be placed so as to give good cross-ventilation. If halls have open types of roof, additional ventilation may be obtained through the gable ends, high-level dormers, or ridge vents.

### Storage

Provision has to be made for the storage of chairs, etc., in almost all halls when the latter are cleared for such purposes as dances; but it is also often necessary to store tables, stalls and similar equipment used in the hall from time to time, together with theatrical scenery and properties. Chairs, tables, and similar equipment must be stored in a position easily accessible to the floor of the hall, while scenery and the like must be in close relation to the stage. As already mentioned, chair-storage space can often be provided under the stage and made accessible through the stage front (*see* Fig. 47 of " Schools "). Larger halls used frequently for theatrical performances should have a room set aside for storage or properties, curtain battens and other stage equipment in positions easily accessible to the stage itself and also from the exterior of the building for the delivery of hired scenery and properties; this room should generally be at stage level. Wardrobe storage and work-rooms are also sometimes needed in larger centres.

Halls used for gymnastic purposes should have a suitable storeroom, opening directly off the hall, preferably at the end away from the stage to provide for all the removable apparatus; this room should have an area similar to that recommended for school gymnasia.

When small halls are to be used by a number of clubs or societies, especially if there are few other committees or club rooms, a series of lock-up cupboards may be needed and should be planned so that they do not obstruct the full use of the room for normal purposes.

### Green Room

It is most desirable to have a large room or open floor area behind the stage in which performers may assemble before moving on to the stage, as by this means the wings are kept clear of waiting artists, thus facilitating the handling of scenery and properties. The green room should be on the same level as the stage. Daylight is not necessary and, in fact, may be an inconvenience.

It is quite usual to plan this room as an open space from which the dressing-room accommodation is approached, but the possibility of using it also for rehearsals or readings should be borne in mind.

### Dressing-Rooms

The numbers and size of these rooms vary according to the size of the scheme and the amount and extent of the theatrical performances anticipated. At least two rooms are required, although it may be possible to use one large room divided by a folding screen or partition in small hall schemes. In the larger schemes the minimum number of dressing-rooms is one small and one large room for each sex, but it is advantageous to have a number of small rooms for the use of principal artists in addition to the large rooms. Lavatory basins should be installed, either in or adjoining all dressing-rooms, and W.C.s for each sex must be planned in close proximity. Dressing-rooms should be generously equipped with well-lighted mirrors and when the rooms are used solely as dressing-rooms, fixed continuous make-up tables should be installed below the mirrors.

### Games Rooms

*See* Part 1: Recreation.

### Club, Committee and Common Rooms

Rooms may serve jointly as dressing-rooms or club or committee rooms in small schemes, but in larger schemes, separate rooms should be allocated for these uses. Also in large schemes, if conditions permit, separate rooms should be planned for the use of younger people, preferably in positions where noise will not disturb the use of adjoining rooms. Common rooms will need to vary in size with the population of the district served by the centre; large centres will need at least one room of 800sq. ft. to 1,000sq. ft., and in smaller centres a room of 500sq. ft. to 600sq. ft. may well suffice.

The kitchen and canteen should be planned in close association with the common room. General purpose rooms should be of varying sizes in each scheme in order to provide suitable accommodation for different-sized organizations, however large or small. Rooms may be designed with some advantage on a unit basis (Fig. 18); this permits of regular fenestration and straightforward elevational treatment, and leaves internal partitions readily alterable if need arises in the future. Rooms should not be more than 18ft. to 20ft. in depth for economical planning; in fact, greater depths should be avoided as lighting from the windows, especially where the latter are on one side only, may become insufficient. A good working grid-unit seems to be from 11ft. to 13ft. by 18ft. to 20ft. in depth. Fig. 18 is based on a unit of

12ft. and shows that by the careful planning of partitions, both fixed and movable, rooms of several sizes are made available. A room extending for three 12ft. bays can be used either as a fair-sized club or common room or as two committee rooms, one for a small organization and the other for a large meeting.

Lockers or cupboards are often wanted for committee or club rooms where each body using the rooms may lock up its own property. The space-needs of these cupboards vary considerably; some are required to store a few books, whereas others have to house a fairly considerable quantity of apparatus. Fittings on a standardized unit basis should be built into the building for this purpose whenever possible. Such a course makes for economy and is tidier and cleaner than the provision of loose furniture. Suitable units for such fitments may easily be settled with the promoters and can become constant throughout the building, whether in the initial scheme or in the ultimate extensions.

Rooms to be used as classrooms or for similar purposes may well be based on the same units as those adopted for club and committee rooms, and planning and general arrangement conform to the usual requirements of school buildings. Aspect for these rooms, either as class, club or committee rooms, is not of such importance as in day schools, in view of the fact that they will chiefly be used during late afternoons, in the evenings and more especially during winter months. Some main club and common rooms may, however, be in constant use throughout the year; then full consideration should be given to the most suitable aspects and, where possible, suitable prospects. In addition, easy access to gardens or terraces assists attractiveness. Where club rooms are used regularly by old people, pleasant and quiet aspect becomes doubly important.

One of the minor problems attached to club rooms concerns furniture. This has often to be varied for each successive use of the rooms; it is wise, therefore, to incorporate in the general plan some suitable storage places of such sizes as may be adequate for spare and alternative furniture to be kept near to the various rooms to avoid excessive handling. Much of this re-arrangement of rooms and contents for different purposes is carried out by members of individual groups using the rooms and much damage may be done both to furniture and building by carelessness brought about by bad planning at the outset of the scheme.

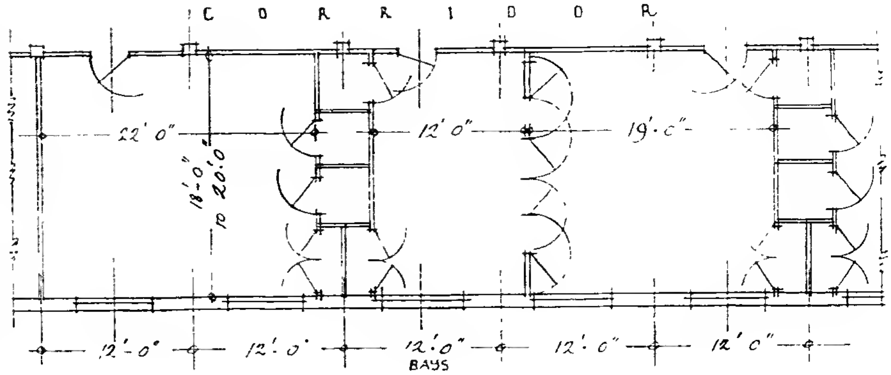



Fig. 18 Planning multi-purpose rooms

### Reading Rooms

The amount of accommodation for reading, library and news-room purposes varies from scheme to scheme. Generally, however, it is probable that one room may have to serve the combined uses. The room may be a small one in which members may read current periodicals and possibly have facilities for writing, or it may be quite a large library with wall shelving and library reading tables, etc., occupying two or more rooms. The alternative, which may be a welcome asset to the community centre, is a branch of the town or county library planned to form part of the whole scheme. If such a library is contemplated, it should be based on the normal open-access library layout, with a librarian in charge at fixed hours to control the changing of books. If the librarian can only attend on certain days of the week or for a few hours daily, it may be advisable to have a separate reading room which is always available, or the bookcases must be fitted with doors and be locked if the same room is to serve both as the library and reading room. Full information concerning the planning, equipment and furnishing of libraries and reading rooms is given in the section on "Libraries."

### Gymnasium

If a gymnasium is provided it may also be used for indoor games such as badminton, deck tennis, table tennis, fencing and boxing. It is desirable that the gymnasium be so sited that direct access is available and that it is adjacent to an open-air space suitable for exercises and training. One wall might, with advantage, be designed as a series of large glazed openings. Generally, gymnasia in community centres should follow those recommended for secondary schools in the section on "Schools," except that the wall bars may need to be moved or limited to one side, if openings are provided on one long wall. Also, the changing rooms and shower baths may need a little different treatment to give increased privacy, especially those used by women.

### Changing Rooms

*See* Part 1: Recreation.

### Boxing

*See* Part 1: Recreation.

### Refreshments

The Ministry of Education Report on Community Centres stresses the importance of providing good canteen facilities as a means of assisting conditions at the centres and as a factor in the social education of members. A good canteen should also be a profitable addition to the income of centres.

# ***Community Centres***

## ANCILLARY ROOMS, CLINICS

The service of alcohol is rather a controversial matter; views may be obtained that are both favourable and strongly opposed. If alcohol is served a club licence will be required, which will necessitate the control of bars and storage in non-licensed hours to comply with the requirements of local licensing authorities.

In small halls and village clubs, it is possible that refreshment service will be confined to light refreshments. Every hall, however, regardless of size, requires a kitchen for the preparation of meals of some kind. This accommodation may be arranged in two ways; firstly, as a very small room in which a cooker and sink are placed and which is used only for actual cookery work, and to which another room must be attached in which all other preparations such as cutting bread and butter, laying trays, etc., can be done; such an arrangement allows for a fairly large space to be available for other uses when cooking is not needed, by the closing-off of the small kitchen. The second layout which is more generally approved is to take one fairly large room in which a cooker and sink are placed and all associated tasks are performed. The reason for preference is that the kitchen frequently has to cater for large numbers; also that it will provide room for small cookery demonstrations in connection with Girl Guide and Women's Institute activities.

Fig. 19 illustrates two kitchens for the smaller type of centre. Frequently a copper is also fitted for the provision of large quantities of boiling water required within short periods. In Type A the kitchen is separated from the committee room by a folding partition which permits the two rooms to be used together for demonstrations. Type B, with two rooms in addition to the kitchen, allows one free room for committees, etc., while one is being used in connection with the kitchen for service to the hall itself; also, it allows two separate organizations to be served with refreshments at the same time.

In larger community centres the amount of space needed can usually be provided in one room, with the possible addition of storage space and, in some schemes, with the addition of a pantry or servery. Where, however, a really full-meal service is to be provided or where the unit forms part of a school-meal service, the kitchen should be developed on the lines recommended

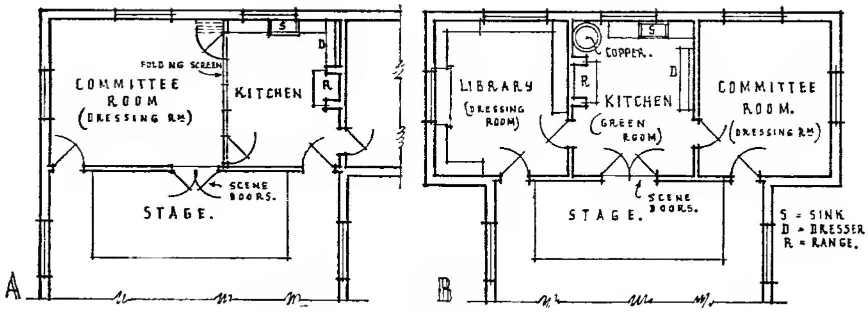



Fig. 19 Kitchen accommodation

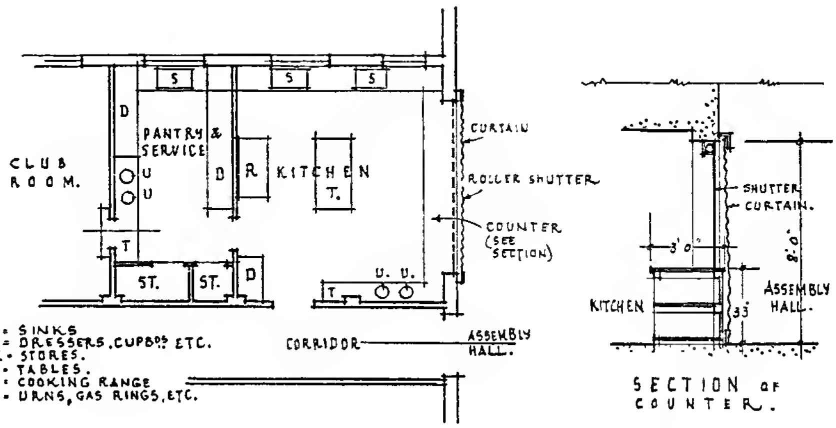



Fig. 20 Refreshment service

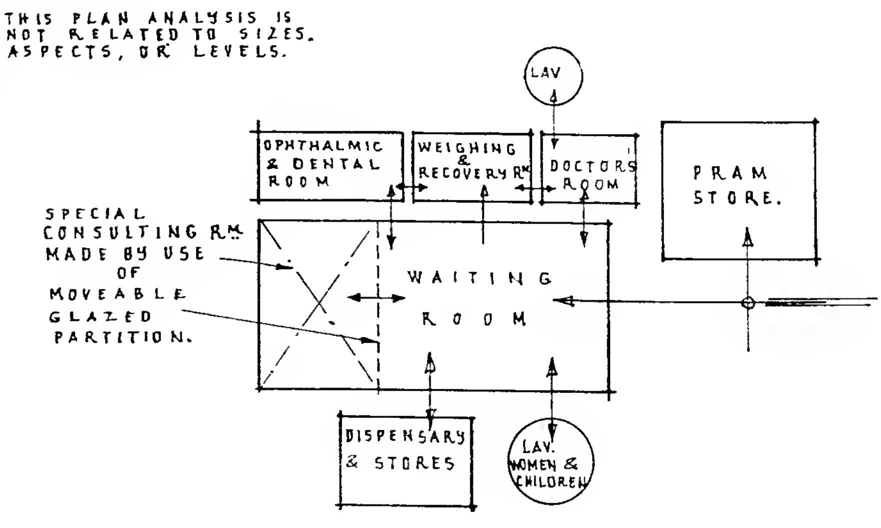



Fig. 21 Welfare group

in the section on " Schools." The area of the kitchen is entirely dependent on the probable number of persons to be served at one time and the nature of the meals served; it should be remembered in connection with large functions that service will often be wanted for many persons during very short intervals and, therefore, it is unwise to restrict unnecessarily either the room area or the service counter length.

As regards cooking apparatus, in small centres a large gas or electric cooker will generally suffice for all purposes, but in larger centres a hot-water boiler and/or urns will be necessary. For any scheme providing full-meal service the apparatus will have to be installed on a much more generous scale and will normally follow that required in school or restaurant kitchens.

It is advantageous to plan the kitchen adjoining the main rooms to be served, for example, the hall, club rooms, and to separate these rooms from the kitchen or servery by means of sliding or rolling shutters closing the remainder of the opening above a counter; care must be taken to reduce the passage of sound (such as washing-up of china) penetrating to the main rooms, and therefore a heavy shutter should be installed and, on occasions, it may be necessary to cover the opening with a heavy curtain.

Fig. 20 illustrates a layout based on the planning of the kitchen adjoining an assembly hall, but it also serves the main club room on its other side by a service hatch, and adjoining is a main corridor by which rooms of lesser importance may be served. The main equipment necessary is shown in the figure.

Care should be taken to control heat and smells from the kitchen, especially to prevent penetration to hall or club rooms; this usually may be achieved by an extract fan in one of the windows and/or extract ducts placed over cooker and sinks.

The second part of Fig. 20 gives in greater detail the typical service counter between a kitchen and an assembly hall; this counter should be not less than 3ft. 3in. high above the floor and is made 3ft. wide to provide space to stack supplies ready to serve quickly. The opening is shown closed with a roller shutter covered by a curtain on the hall side.

The amount of food storage is likely to be small in most schemes and in small schemes none will be needed; it is only where continuous and regular or full meals are served that normal larders and stores are required.

A good service entrance, well screened from general view, together with an enclosed yard, is most necessary; roadway access to this yard is desirable and in larger centres is essential, and it should be provided with adequate turning space for vehicles; the same roadway should serve also for fuel deliveries and refuse removal.

### Clinics

Clinics may be concerned with the health of the whole family, but are more likely to be confined to infant and maternal welfare in conjunction with the women's clubs, such as the Women's Institute and Mothers' Union. As the activities mostly take place in the morning and the afternoon and not during the evening, rooms may be used which in smaller centres will serve other purposes during the evening. A large club room or even the hall may well serve as a general waiting-room and lecture room. Where, however, a separate suite of rooms or a wing is devoted to clinical activities, specially designed rooms must be available which are not used for other purposes. Lavatory and W.C. accommodation is essential adjoining the waiting-room or any room used for the purpose. A room is required for use as doctor's consulting room which should be at least 180sq. ft. and should adjoin the waiting-room and be equipped with a sink or basin with hot and cold water. A small club room may serve as doctor's room if it has a sink or lavatory basin. A nurse's room is not always necessary, but is desirable, and should be of similar area to the doctor's room.

A separate weighing room is usually provided, although part of the main room or waiting-room might be used, but if dental or minor operations are carried out, the weighing room can also serve as a recovery room if made large enough for one or two beds or couches. Dental treatment or minor operations requiring the use of a recovery room would probably not take place at the same time as the weighing of children, thus the room can be used for both purposes. A sink or lavatory basin is desirable in this room.

The other important room is one which may be used for either dentistry or ophthalmic work, or both. For both purposes, hot water, gas and electricity services are needed. The room should be at least 180ft. super and if used for eye-testing should have one dimension (which may be on the diagonal) of not less than 21ft.

In addition to the rooms enumerated above for particular purposes, all of which might be normal rooms of the community centre adapted for those uses during certain hours of the day, there should be a dispensary (and store opening out of it) in which medicines, medical appliances and materials and such goods as infant foods may be stored and distributed to those attending the clinic. A dispensary requires a considerable amount of shelving, a sink with hot and cold water and a working bench or table steady enough for weighing apparatus; the needs of the store are chiefly shelving.

Fig. 21 illustrates diagrammatically the relationships of the various rooms forming a typical small clinic. The waiting-room must give access to all the rooms and lavatories; the doctor's and dental rooms should both connect with the recovery and weighing rooms. Detailed information on the planning of clinics is given in the section " Clinics and Health Centres."

Covered perambulator storage should be provided and, if possible, a room in which children may play while waiting for mothers and other children who are receiving attention at the clinic. Information on planning for perambulators is given in Part 1: Transport.

# Factory Buildings

## INTRODUCTION, SITES

### Introduction

Factory design has progressed beyond the mere provision of structural necessities, but the value of accommodating machinery and operatives in surroundings which are at once attractive and suitable to the purpose is still not fully appreciated. Although highly expensive machinery is considered essential by manufacturers, the building that is to house it is frequently given less attention. The day is passing, however, when manufacturers are content to use badly lighted, heated and ventilated structures, which only, at best, keep out wind and rain.

Apart from control of the locations of factories under the Town and Country Planning Act, 1947, the Distribution of Industry Acts, 1945 and 1950, and of the construction of factory buildings by local building acts and bylaws, the principal legislation affecting industrial buildings is contained in the Factories Acts, 1937 and 1948. These Acts and the Regulations made under them are divided into a number of parts which detail requirements under the headings " Health," " Safety," " Welfare " and sundry other matters which include control of humidity, dust and fumes and the use of underground rooms. Although the following notes are compiled to be in accord with the Acts, the latter should be consulted by designers of industrial buildings in the early stages of any scheme.

Factory buildings must be designed round purely basic requirements, and the architect, especially in the general layout, must discuss with the owner, and fully understand, the processes and their sequence in each individual scheme in order to design the most suitable arrangement of departments. Every factory has its own problems and consequently there are only a few basic principles which apply to all schemes. The line of production from the entrance of raw materials to the dispatch of the finished article must be continuous and direct. Cross traffic from one process to another must be avoided. Provision must be made for possible changes in the manufacturing process. Plenty of natural light is essential for most departments and good ventilation should be studied if satisfactory working conditions are to be provided. Plans should be simple and not influenced by a desire to produce elevations of symmetrical or otherwise preconceived character. Clear open spaces should be aimed at for freedom in every direction; unnecessary roof or ceiling supports must be eliminated or unit planned; rearrangements of plant and future expansions must be visualized as far as possible at the initiation of every scheme.

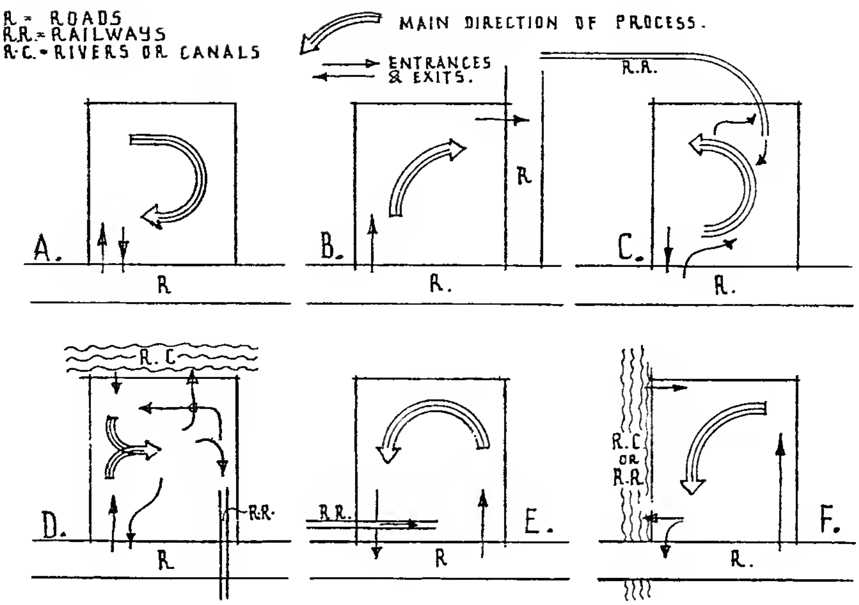



Fig. 1 Types of sites

### Sites

Among site considerations, are such matters as the proximity to a good labour market providing types of employee that will be needed, residential facilities for employees, either in an existing town or village, or where suitable housing may be provided; transport facilities for personnel, raw materials and finished goods; adequate systems of water and power supplies and sewage disposal, and last, the proximity of sources of raw materials and markets for finished products. An important factor affecting the plan is the regularity of deliveries of supplies and whether the disposal is regular, or only seasonal, as these points affect very greatly the requirements of storage space to be provided.

The main layout of the units of any factory must be made in relation to the means of access to the site and is dependent on the method by which the raw materials and finished products enter and leave the works. In some cases road access only is available, in others road and railway are used and in some, road, railway and river or canal, or any two of them. The placing of approaches from each of these services must be considered in relation to others and in relation to the dependence of each process on the various services available; for instance, in one factory all raw materials may arrive by water and leave by railway, whereas in another the reverse may take place, yet in others raw materials arrive by railway, but finished goods leave both by road and water.

Fig. 1 illustrates six typical sites in relation to the means of transport and the way in which the position of the system of transport influences layout and general direction of the manufacturing process through the factory. Type A has single road facilities only. Type B again depends on road transport entirely, but by confining entrance of goods to one road and dispatch to

the second road, the progress in the workshops is diagonally across the site. Type C has delivery and dispatch from road and railway placed at opposite sides of the site; this complicates general layout, unless the delivery from one source, the railway, for instance, is a single material such as coal, when the layout becomes easier. In this example final processes must be so placed that dispatch can be made either by railway or by road without crossing the general circulation. Type D is much more complicated, as three transport systems are being used for both arrival and dispatch, each placed on a different side of the site; it is therefore impossible to avoid at least one crossover in the circulation, which is shown, for instance, as arrival by railway across dispatch by river. Type E also necessitates the crossing of circulations, as a railway siding, by which arrivals and dispatches are made, enters the site and adjoins the roadway, therefore the general circulation is in an anti-clockwise direction with dispatch by road crossing arrival by railway. Type F is similar to Type E, except that the lay-out is based on the necessity for considerable storage space near the road entrance and on the fact that rail or canal deliveries can be well away from the road entrance.

Fig. 2 is a typical analysis of a factory to show the circulation routes of the site in relation to the buildings. The entrances for employees and goods are placed near one another, but controlled on opposite sides of the entrance way. A car or lorry park is placed near the entrance and is also adjacent to the offices. The vehicles circulate round the site in one direction; there are no cross circulations, but some storage for raw materials and goods for dispatch is separated from the main factory block as the main bulk of deliveries and dispatches are directly to and from this block. The power plant is placed so as to be near to processes requiring the greatest amount of heat or steam power.

Fig. 3 illustrates a typical layout with two methods of transport, and some cross circulations are necessitated. The employees and road traffic enter together on each side of one control office, a slight advantage over the system shown in Fig. 2. The layout is designed for delivery of coal and raw materials by rail, and the main dispatch by road, although small

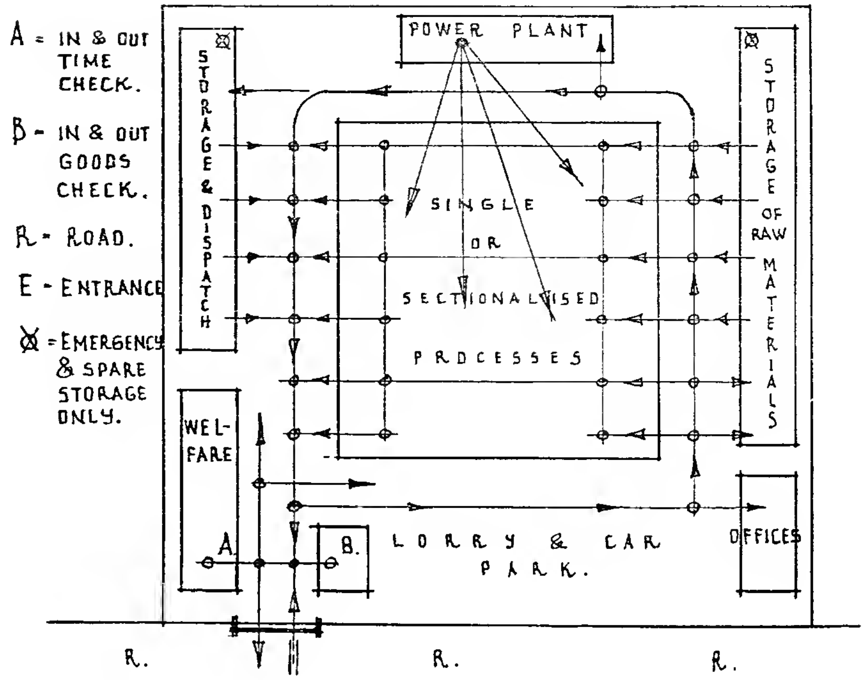



Fig. 2 Typical plan analysis

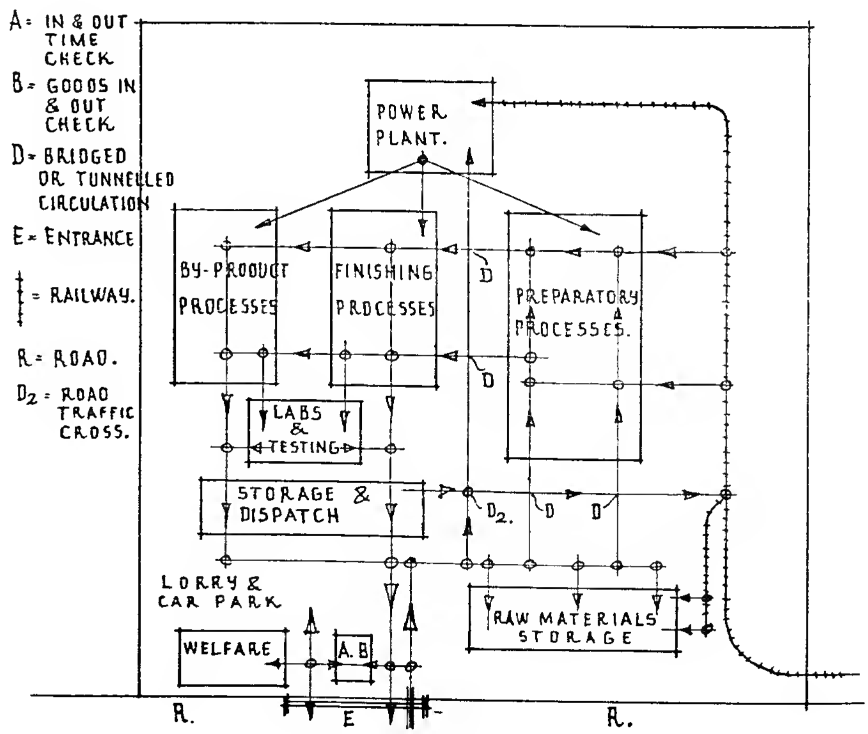



Fig. 3 Typical plan analysis

quantities of goods may be dispatched by rail, which necessitates the cross circulations shown; these may be overcome, if necessary, by means of bridges or tunnels, if road traffic is likely to be so continuous that traffic would be hampered.

Welfare buildings are usually placed near the entrance, as in many processes employees wash and change clothes for working hours. These changing rooms then become an important element in this part of the plan which is usually arranged so that employees only circulate in ordinary clothes immediately on entering and leaving the factory.

### Process Buildings

The types of buildings required for manufacturing processes may be divided into two main groups; single- and multi-storey buildings. Both of these groups, in particular the former, have many variations of form due to types of construction and roofing. The selection of type is dependent mainly on the product with which each factory is concerned and thc method of circulation during the various manufacturing processes. At one time the single-storey type was more general, but with improved methods of handling goods and the use of high-speed lifts, hoists, chutes and conveyors, many processes are more conveniently dealt with in multi-storey buildings. Single-storey factories are general for handling heavy goods, but this problem does not affect the majority of processes.

Land value has a direct bearing on the number of floors to be used and organization becomes more expensive when the area to be controlled is very large.

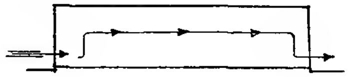
Single-storey buildings providing a given area of floor space generally cost more to construct; single-storey buildings covering large areas are more difficult to heat and ventilate. If it is properly designed, there seems to be no difficulty in using machinery on upper floors, in spite of weight and vibration. Single-storey structures have an advantage in the fact that clear spans between supports, if necded, may be much larger than those of multi-storey buildings.

Many manufacturers build single-storey buildings, providing for future extensions to be made as multi-storey structures over the whole or part of the first building.

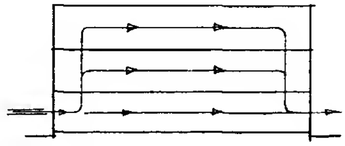
### The Section

The effect of the process layout on the section is a primary consideration when the selection of type of building to be used is under consideration. Fig. 4 illustrates a number of typical sections showing variations resulting from layout for a particular process. Type A is the straightforward single-storey layout in which raw materials enter at one side or end of the building and circulate across. Type B shows a multi-storey building in which different articles are made on each floor, or in which processes take place on each floor. Type C is a two-storey type in which the same raw materials are handled on the upper floor and are fed to varying processes or to several sets of machines doing the same processes on the lower floor. Type D is a multi-storey type in which the raw materials are hoisted to the top floor of the building and pass from floor to floor in a continuous circulation through the building during manufacture. Type E shows a combination of the types described above. Such a combination may arise where the commencement of the process involves the hoisting of materials to silos or top floors of a high building; or where the process begins with a series of operations needing continuous handling on the same level, the goods being subsequently lifted to upper floors for packing purposes, or to the top floor for further gravity processes or for storage.

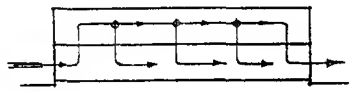
Figs. 5 and 6 illustrate a number of typical sections of single-storey factory buildings to show the various methods of roofing and the necessary supports required to carry roofs. Type A is the ordinary equal-sided truss type which has often been used with a part of each slope glazed. Large spans are not economical with this type of roof and the factory must be planned with the axis placed north and south; otherwise south light or direct sunlight is too strong and unpleasant for working conditions. The glass in this type is difficult to clean. Type B is the ordinary " north-light " truss section which has produced the saw-tooth skyline associated with factory buildings. Large spans of 50ft. or 60ft. between supports are not very economical with this type and lighting is not always satisfactory; window cleaning is difficult as the only access is along narrow valley gutters, which are themselves a



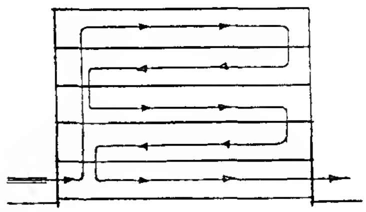
A One storey: single process



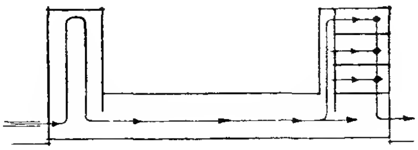
B Multi-storey: single processes



C Two-storey: multiple processes



D Multi-storey: continuous process



E One storey: single process with multi-storey storage and warehousing

Fig. 4 Diagrams showing effect of processes on section

frequent source of minor troubles. Type C is based on a system of clerestory lighting formed by raising the trusses on vertical lights; the system also calls for east and west lighting. This type allows ample head-room for overhead hoisting tracks, especially when travelling-crane cages or control cabins, and space for ducts, etc., are needed in the central portion; windows are vertical and can be cleaned easily from the flat roofs, and the whole of the window area can be opened easily. In this type, fairly large spans are possible. Type D adapts the "north light" for east and west light and has advantages over two spans of the north-light type, giving better lighting over a larger area of floor space. Windows are accessible from the flat roofs on each side and difficult gutters are avoided. The number and spacing of supports needed for the trusses are dependent on the span, but by use of deep beams or lattice girders the number of the central row may be greatly reduced, if necessary. Type E, somewhat similar to Type D, eliminates the central row of supports; this type can be used to give very large, clear central spaces. The depth of the beams allows a continuous row of ventilators, above which are lights. The outside bays can be made very wide if the window heights are raised high up, as indicated on the figure, so as to light back a considerable distance; if, however, this is not necessary, the side roofs may be flat. This type is readily adaptable to concrete construction by using a flat or curved roof over the central span. When east and west lighting is used, direct light should be diffused by the use of prismatic or ribbed glass of heat-resisting type, although the latter cannot be used when trueness of colour is important as a process factor.

Good ventilation is essential to factory life. Where a system of artificial ventilation is not an economical or a necessary proposition, roof sections which allow easy opening of the whole, or at least a considerable part, of the glazed areas are an advantage, as in Types C, D and E. In many factories the windows are opened mechanically in continuous lengths up to 500ft. or 600ft. with a maximum opening of about 70°.

The shape of trusses to carry the roofing is to some extent dependent on the span to be covered, but there are also other factors to be considered carefully, such as provisions for cranes, special lighting requirements, amount of clear space between supports for trusses and the actual type of covering to be used. For general purposes trusses should be placed 10ft. to 15ft. apart for economy in purlin construction and roof covering, but various factors influence dimensions, as, large door openings or weights borne by gantries if carried on the same supports as trusses.

In most single-storey schemes steel trusses seem to be a more rapid and easily adaptable form of construction than concrete except in some examples where upkeep is a very important or difficult factor; reinforced concrete also makes for reduction of fire risks.

Fig. 6 illustrates a number of alternative sections based on the use of reinforced-concrete, instead of steel-framed, construction. Type A requires east and west aspect as it is lighted from the outside walls only, its comparatively small spans are suitable for long lines of building. Type B is similar to A, but the placing of the lighting at a greater height permits the introduction of overhead cranes, runways or shafting; it has solid lower walls, an essential feature for some processes and types of machinery. Type C is similar to type B of Fig. 5, and provides normal north lighting with a curved shell roof.

Type D has a flat-pitched roof with north lights and is suitable for precast- and/or pre-stressed-concrete methods.

Type E shows lighting in the form of a continuous roof light along the top of a curved roof; this type can be used for comparatively large spaces and can be designed to give a high daylight factor over the whole covered area. This type of roof lighting is sometimes provided by smaller circular or square lights dispersed over the area of the barrel shell roof. In most cases manufacturing processes will dictate the type to be adopted.

Type F indicates a domical roof with four-way clerestory lighting; additional lights in the roof could be arranged if required. Curved roofs arising from constructional forms tend to assist lighting greatly by reason of good unbroken reflective surfaces. The reduction of dust-catching surfaces is also an advantage of the use of reinforced concrete.

### Multi-storey Buildings

Multi-storey buildings have certain advantages and disadvantages over single-storey buildings after the essential process plan has been considered and it is proved that a multi-floored building may suit a particular industry. There may be increased advantages due to compactness assisting distribution of motive power, heating, ventilation, supervision and accessibility.

Some more important disadvantages are loss of area needed for lifts, staircases and chutes, possibility of providing top light on the top floor only, small areas clear of columns and the need to provide for fire escapes. The width of the building is largely dependent on the area of window available, which in turn is controlled by the height from floor to ceiling of each storey. Big spans should be avoided, as cost increases after a certain economical span by the square instead of in direct proportion. The heights of storeys generally vary from 12ft. to 15ft. from floor to floor; window areas should be from 30 to 35 per cent of the floor area. Some factories can be increased in span where provisions for storage may be needed in the central or darkest part of each floor.

When high fire-resistance in multi-storeyed buildings is a particular requirement, reinforced concrete construction is often found to be less expensive than encased steel framing. Slab and beam construction in concrete or steel is usually cheaper in factories where spans are narrow, but for larger buildings "mushroom" construction is better.

Fig. 7 shows several types of multi-storeyed buildings. Diagram A illustrates the beam type of construction which does not give a level surface on the underside of the floor and may present difficulties with suspended shafting and pipe lines. A further disadvantage is that it is essential to have piers on external walls, which interrupt continuous glazing and cut off valuable light. Moreover, the beam over the window does not permit windows to extend to ceiling level; this reduces the depth of well-lighted area from the window wall and may limit ventilation. Diagram B illustrates the "mushroom" type of construction, which gives flat ceilings desirable for fixing shafting and services; at the same time does not require external structural

# Factory Buildings

## THE SECTION, MULTI-STOREY BUILDINGS

supports, thus allowing a continuous surface of glass as external walls if required; the windows may be carried up to the ceiling level.

Type C shows a half-section through a factory building in which the main supports are not placed in the external walls, but a part of the floor area is cantilevered from the supports, similar in most ways to the "mushroom" type. This figure also shows a method of lighting wide factory buildings by the introduction of a large covered light well which lights cantilevered galleries and the ground floor.

Type D illustrates a combination of a multi-storeyed unit and a single-storeyed unit or units, the height of each part being dictated by the processes carried out in them. It is wise that a single-storey building adjoining a higher one should have a flat roof which will not cut off light from lower floors of the taller parts.

Floor levels should be continuous, as ramps or steps interrupt easy communication. Windows are usually kept about 3ft. 6in. above floor level, and parapets or railings must be placed round all openings in floors and round galleries. Kerbs should also be placed round all openings and galleries to prevent tools, etc., being dropped or kicked on to floors below.

Wherever possible, the heaviest machinery and processes should be kept to ground floors. The more support for machinery bases or materials which can be taken from specially designed beds at ground level, the better; even with travelling cranes, conveyors, etc., separate supports, independent of the structure, should be the rule. Such design makes for economical construction of the building, for it can then be regarded as almost entirely a protection from weather and other external factors.

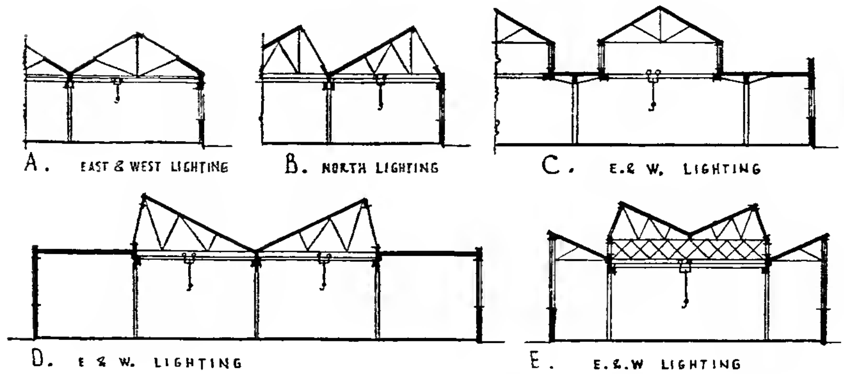



Fig. 5 Single-storey type sections

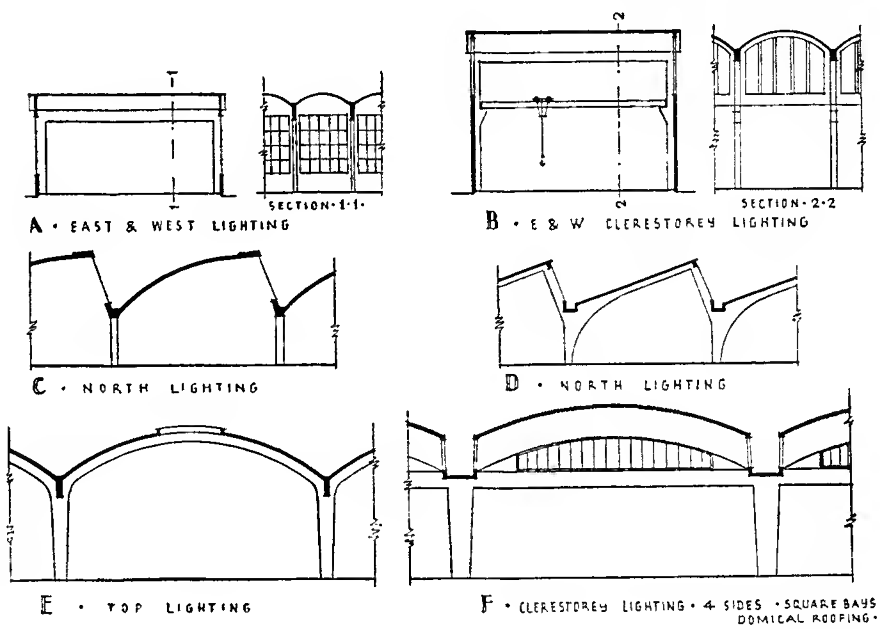



Fig. 6 Shell, barrel and other concrete types

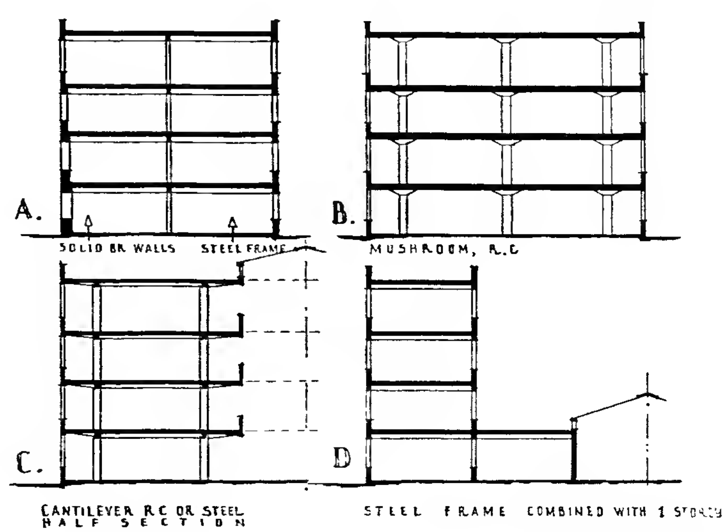



Fig. 7 Multi-storeyed types

# *Factory Buildings*

## THE PLAN, LIFTS, MEANS OF ESCAPE

### The Plan

Fig. 8 illustrates several types of plan arising from varying processes, and the order of handling from arrival to departure. Type A shows a factory into which goods enter a large common store and pass through three dissimilar processes from which dispatch is separate in each case. Such a scheme implies a long building linking the three process buildings planned at right angles to that of the storage building and separated for easy circulation of delivery vehicles.

Type B shows a factory with all processes under one roof. Raw materials enter a common store and pass through one of two processes, to be packed together at completion. Type C shows a scheme in which a large building area is needed. Goods enter at one end and leave the other end of one block, but are manufactured in a series of parallel processes.

In Type D raw materials arrive at three separate stores, each passing through its own process shop to an assembly plant for finished articles for dispatch from one packing shop.

The relationship of the arrival, processes and final dispatch of goods not only influences internal layout of shops, but also controls the general layout of all buildings which make up a complete factory. Type A is a series of small-span buildings attached to one another, whereas Type C requires a large clear area placed against a smaller-span building. Each example shown in Fig. 8 might also be either a single or multi-storeyed building.

### Lifts, etc.

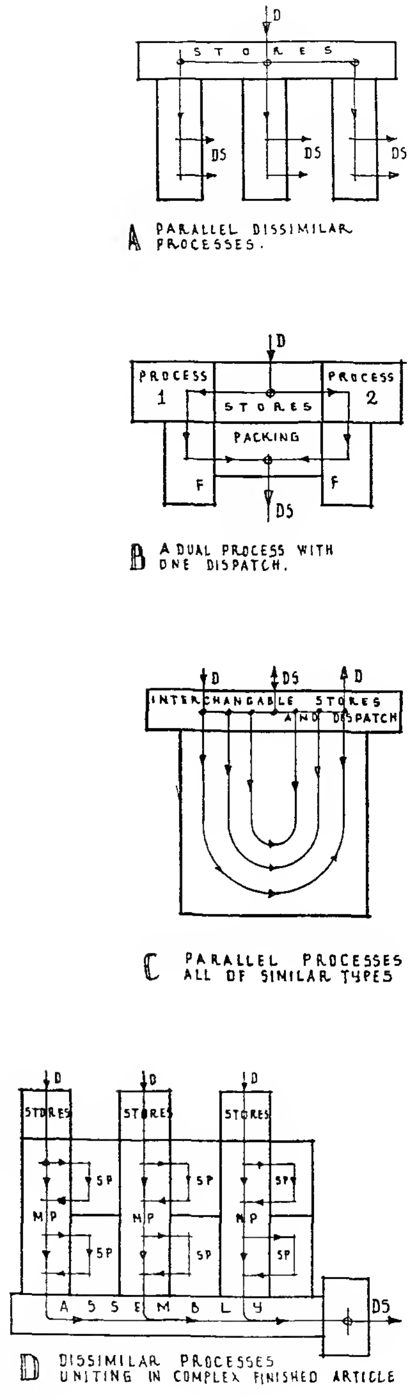
Provisions required for handling goods have bearing on planning and particularly on heights. bay widths and sizes of door openings. Lifts are installed in multi-storeyed buildings for transport of goods and less frequently for carrying employees. Goods lifts should not be designed for faster speeds than absolutely necessary. A large margin of load is a wise provision in new installations to guard against mishandling or future changes. Lift wells must be enclosed with guard rails and wire mesh for the full height; in some districts by-laws require lift wells in fire-resisting buildings to be enclosed in incombustible materials with fire-resisting doors or shutters; in some circumstances, particularly where the lifts are in the centres of fire-resisting staircases, the enclosing walls of fire-resisting materials may be limited to 4ft. above each floor level and the remainder of the height enclosed with wire mesh.

Goods lifts should not, however, be placed in staircase wells, nor be placed near, or connected directly to, escape cases. The sizes, shapes and travelling area of hoists, chutes and conveyors of all types must be known in the early stages of the scheme, as affecting steelwork, loading of supports, trimming of floors and layout generally. All conveyors, belting and moving parts of machinery have to be enclosed as a safeguard against accidents.

The sizes required for transport apparatus vary too much with each trade and process for useful figures to be given, but from the designer's point of view much more space than is at first anticipated is usually required for trucks, trolleys, loading platforms, etc., where goods may wait at the start and finish of each operation. *See* Part 1: Circulation.

### Means of Escape

Full provision must be made for escape in case of fire or other accidents. Each building is generally treated by various official regulations on its own merits, with special reference to the number of employees, type of materials in use, fire-alarm system and surrounding property. Generally, in multi-storeyed buildings at least one enclosed staircase and exit are required, in addition to an alternative means of escape such as a similar enclosed staircase, a staircase in another block to which access is given by doorways in division walls, external balconies giving access to adjoining buildings, or an external iron staircase. All alternative escapes must be permanently fixed in position and not the kind which require manipulation to be put into use. Clear gangways must be provided to all staircases and exits, and doors must open in the direction of the exit and be clear of steps. Upper parts of doors should be glazed with transparent fire-resisting glazing. Windows on upper floors facing roads or open spaces should be made to open easily at sill level and have one opening area at this level




KEY

D—deliveries
DS—dispatch
MP—major processes
SP—secondary processes
F—finishing

Fig. 8 Types of processes: effect on plan

sufficiently wide and high to allow a fully-grown person to pass through in case of need.

### Staircases

Internal fire-escape staircases together with the lobbies and landings, should be enclosed with 9in. of brickwork or similar fire-resisting materials. Floors to landings and lobbies and steps must be of approved thicknesses. Some authorities will only require one staircase in each block to be of concrete or similar incombustible materials; the remainder may then be of fire-resisting hardwoods if the minimum thickness is not less than 1¾in. Generally, internal staircases should be against an outside wall and should have adequate natural light and permanent ventilation. Treads should be not less than 10in. wide, clear of nosings, and not more than 7½in. high. Continuous handrails are necessary on both walls. Doorways and staircases should be at least 3ft. 6in. wide and must be increased to at least 4ft. 6in. if used by more than 200 persons, or 100 persons on any one floor. Winders should be avoided, and each flight limited to 15 steps with landings at the top and bottom of each flight. External staircases and gangways must have a balustrade 3ft. 6in. high, with balusters not more than 6in. apart. Windows or other openings near such staircases may be required to be glazed with fire-resisting glazing in fixed sashes.

### Loading Docks

These are required in connection with the majority of factory buildings, either for use with motor vehicles or railway wagons. Two types are in general use for motor vehicles, as shown in Fig. 9, A and B. Type A has separate bays formed for each vehicle, and Type B consists of a continuous raised platform against which vehicles back in normal circumstances, though vehicles may draw alongside the platform if required. Type A has the advantage that unloading may take place from the sides of vehicles without disturbing the general flow of traffic, as might happen with Type B. It is usual to raise the platform of the dock about 3ft. 6in. above the road level, unless "low-loading" types of lorries are to be used. It is wise to provide a covering over the loading dock and at least 3ft. of the area occupied by the vehicles as a provision against wet weather; the covering should leave a clear height of at least 18ft. to allow for the highest vehicles on the road (16ft.) to pass under it and leave some space for light to circulate or to fix "bulk-head" artificial lighting under the canopy. The loading docks are sometimes placed inside or partially inside the general area of the building, but if not, the covering should be mainly glazed to light the work-space behind the standing vehicles. Fig. 9C illustrates a loading dock for railway wagons, for which the platform is rather higher than for road vehicles. The space between the rail track and the dock is wider than required for the wagons themselves, but is bridged by the drop sides of the wagons. *See* Part 1: Transport for sizes of vehicles, turning circles, etc.

Staggered loading docks, at which the vehicles back into place at an angle of 45° to the docks and buildings, are sometimes used where space must be saved; it should be noted, however, that this method is only suitable where traffic circulates on a one-way system.

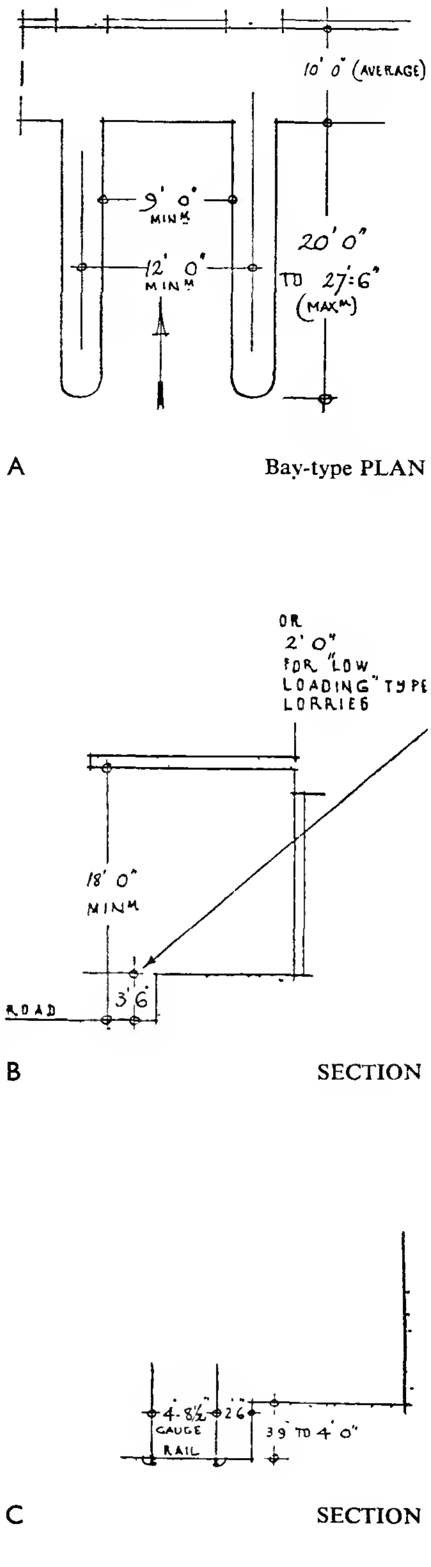



Fig. 9 Loading docks

### Toilet Facilities

In many industries, cloakroom accommodation has to be provided in addition to facilities for washing and sanitary accommodation. Even when such cloakrooms are not compulsory they are a desirable provision in all schemes; in some factories outdoor clothing has to be removed by all workers and kept during working hours. It is essential that a place of safe keeping be provided and, if possible, some provision made for drying clothes in wet weather. Frequently, workers wish to change into different clothing when working and in some factories protective clothing has to be worn.

The essential provisions for an efficient factory cloakroom are, firstly, separate pegs or lockers marked by a number for each worker; secondly, ample space for changing clothes and boots. It is important that the materials and equipment for cloakrooms should lend themselves to easy and rapid cleaning, and that adequate ventilation and lighting, both natural and artificial, be provided. Large cloakrooms should be in charge of an attendant, as unless there is some person in charge, workers are often unwilling to leave their property for fear of theft. Lockers tend to overcome the risk of theft, but their first cost is higher than other systems of equipment.

### Position of Cloakrooms

Two positions for cloakrooms are usual in factory schemes: firstly, general cloakrooms, one for each sex, near the workers' entrance and exit to the factory; secondly, small cloakrooms attached to each "shop" or department. The former seems to be the most satisfactory in practice. It is convenient if cloakrooms are so placed that circulation through them is essential to reach the works from workers' entrances, especially if workers are able to keep under cover during wet weather after the removal of outdoor clothing. Cloakrooms should be laid out in such a manner that there is continuous circulation, entrance and exit doors being kept separate. The important factor in placing equipment is to allow sufficient space for removal of clothes without causing overcrowding during rush times.

### Layout of Cloakrooms

Equipment may be arranged either for direct access by the workers or for the cloakrooms to be cut off and the clothes handed to attendants. The former appears more efficient if workers have to change into protective or working clothing in addition to the mere removal and storage of outdoor garments; also, this system requires perhaps only one attendant for control purposes, whereas the handing-in system requires a number of attendants at opening, closing and meal times.

Lockers have many advantages, especially if workers wish to leave clothing and shoes at the factory. A disadvantage may be that the lockers are kept shut more or less continuously and are only occasionally cleaned out inside; it is essential that they are well and permanently ventilated. Fig. 10 illustrates the general layout of three types of cloakroom. Type A shows the use of open-access type of racks with pegs. In this case employees pass from the entrance to the factory, depositing or collecting clothing as they pass through. Racks should be placed at least 3ft. 9in. apart, with pegs on each side; but if boot and shoe lockers are also needed, spacing must be increased to at least 7ft., the tops of boot lockers being then used as seats, and to 8ft. 6in. if separate seats are placed in the centres of the gangways. A space of at least 5ft. should be given at each end of peg racks for circulation. Type B is the enclosed type where clothing is handed through hatches or openings in a wire-mesh enclosure and hung up by attendants. In this type the clothes racks may be placed closer together as attendants do not require so much room as the employees in Type A; spacing of racks may thus be reduced to 3ft. centre to centre of double-sided racks. The enclosure in which the clothes are placed should be constructed of wire-mesh on metal framing to allow maximum light and ventilation.

Type C shows a cloakroom based on use of individual lockers, which are generally about 12in. by 12in. each and constructed of metal with a wire-mesh bottom, so that heat and air may enter and pass through the fitting to top louvres or through a wire-mesh top. These lockers may either be used without seating accommodation, with a seat rim projecting from the locker (in which case it is raised 15in. or 18in. above the floor), or with seats, fixed or loose, placed between two ranges of lockers; this latter arrangement requires a spacing of at least 8ft. 6in., centre to centre, between rows of lockers placed back to back as in Fig. 10 C. Hot pipes should be placed below each row or double-sided row of pegs or lockers; to dry clothing and to eliminate steam and the smell of drying clothes, good cross-ventilation is essential.

Another method of storage in lofty buildings is to suspend the clothes on hangers from racks attached by pulleys to the roof or ceiling. The clothes may thus be placed in gangways or corridors in the wash-rooms, or even in the workshops themselves, without waste of space during working hours; or increased use may be made of cloakroom space if the hanging racks are not placed directly over other racks standing on the floor. The clothes in this position are safe from pilfering. Radiators for clothes-drying may be placed on the floor under each suspended clothes rack.

Fig. 11 illustrates spacing of cloakroom equipment. Pegs for hats and coats should be placed 18in. apart if possible, in order that clothes should not touch one another. Pegs should project away from walls or divisions to permit good circulation of air round the clothing. Wire-mesh divisions are desirable in double-sided clothes racks. Lockers are generally standard metal productions which vary in size considerably; they should be 6ft. high and at least 12in. by 12in. and, although smaller sizes are sometimes used, the saving in cost is not really justified (*see* Fig. 12). Seats or benches should have teak tops carried on metal supports. All fittings should occupy as little floor area as possible up to a height of 6in. above the floor level to permit of washing the whole floor. Floors are frequently of wood blocks and sometimes of granolithic or similar impervious materials.

### Lavatories

The system which has proved most satisfactory in large factories is the provision of large circular troughs or long ranges of troughs to which is supplied a constant stream of water at a suitable temperature through sprays

which are turned on when required. Individual basins with taps are apt to become dirty, especially where the taps are turned on by workers with dirty hands; if individual water control is needed, a foot pedal system is best. Soap presents a rather difficult problem in factory lavatories, as cakes of soap are so easily lost or removed. The best solution seems to be to provide liquid soap in glass containers fixed over each basin or trough, one to every two basins or washing spaces; or to install piped liquid soap supplies with spring outlets at frequent intervals.

Towels are also difficult; some factories have adopted power-driven warmed-air hand-driers, and others provide absorbent paper towels and have found them to be satisfactory. In other examples each worker provides his own towel, and in others long spring self-rolling towels have been installed.

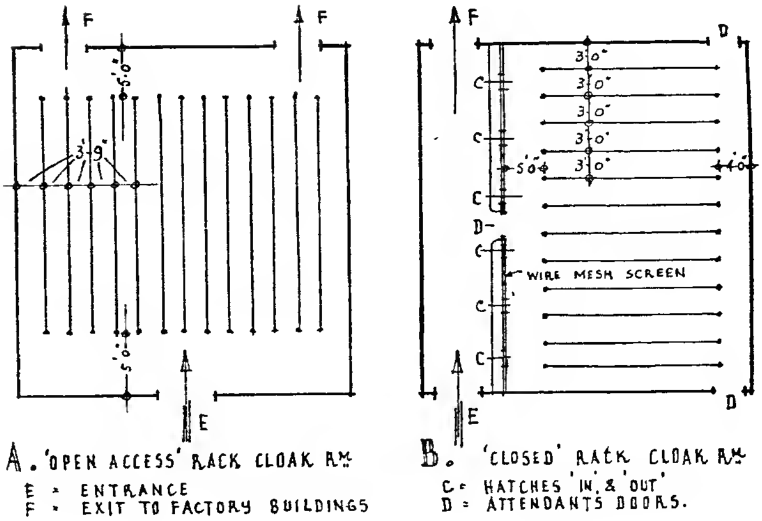
### Drinking Water

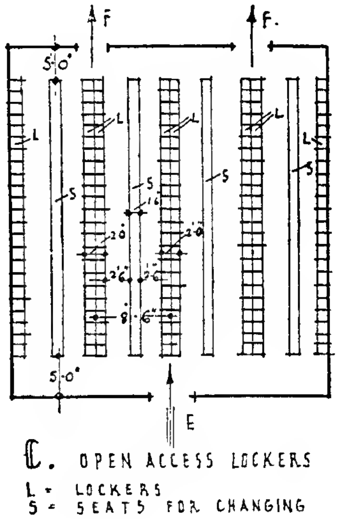
It is required that drinking water be available, conveniently accessible to all employees in all factories employing 25 or more persons, and in some industries in all factories, regardless of the number of employees. The supply must be clearly marked "Drinking Water." The recommended type of water-fountain is one with an upward jet, which ensures that water is not contaminated and also eliminates the need for drinking cups. (*See* Part 1: Sanitation.) Drinking fountains should be placed so that the jet is almost 3ft. above floor level. If two fountains are placed side by side they should be at least 3ft. apart, centre to centre.

### Sanitary Accommodation

Suitable and sufficient sanitary accommodation is required in all factories and workshops by the Factory and Public Health Acts. The accommodation for each sex must be provided separately.

Conveniences must be readily accessible but must be separated from workrooms by an open-air cut-off or by an intervening ventilated space. They must be under cover and divided by partitions which should have doors with proper fastenings. Separate approaches must be provided for each




Above and right: Fig. 10 Types of cloakrooms

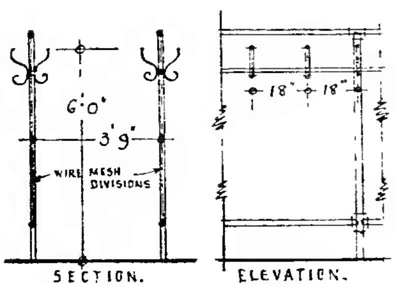



Fig. 11 Cloakroom racks

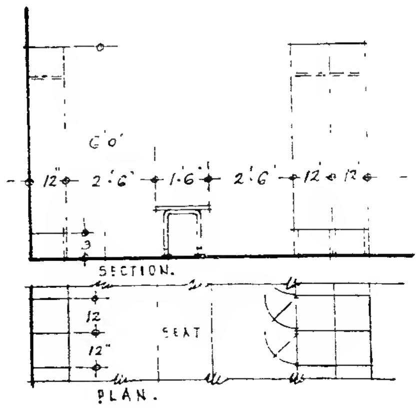



Fig. 12 Cloakroom lockers

sex and all accommodation must have proper screening of the interior.

Sanitary accommodation should, preferably, be connected with lavatories and cloakrooms, but in large factories additional conveniences should be situated conveniently accessible to the workers, as long walks involve too great a loss of time. Unless special artificial ventilation is installed, each convenience should have direct connection with the open air by means of a window and should be on external walls, although sometimes schemes are approved where only top-light and ventilation are available to a room in which a number of conveniences are placed. If conveniences are placed adjoining a workroom a proper ventilated cut-off lobby is essential.

The number of sanitary fitments for each sex are given in the adjoining table. For sizes and positioning of fitments, *see* Part 1: Sanitation.

Artificially ventilated W.C. blocks have been used in a few instances in this country, but their use in American factory buildings is becoming usual. The advantages claimed for this arrangement are that the rooms containing the W.C.s may be placed in the centre of multi-floored blocks, where they are easily accessible to the employees, and do not occupy external wall space on manufacturing floors and consequently block out good daylight from working spaces. Fig. 13 illustrates a sanitary block designed for artificial ventilation and placed in the central portion of the floor space; ventilation is by means of the extract duct in the centre, which draws its air from the factory. It is enclosed in screens glazed with obscure glass, artificially lighted inside the enclosure. All pipes for the various services are grouped on each side of the duct.

The partitions dividing the sanitary block from the general factory floor space must be carried up to the level of the ceiling, or alternatively have a ceiling over at a lower level.

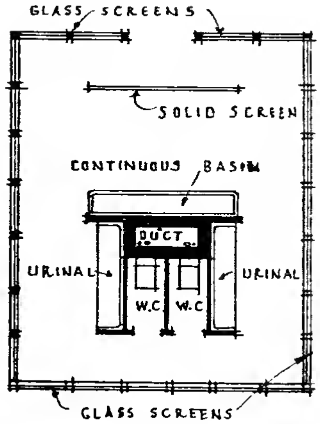



Fig. 13 Internal artificially ventilated lavatory

TABLE FOR THE NUMBER OF SANITARY FITMENTS FOR EACH SEX*

| *Fitment* | *For male personnel* |
|---|---|
| W.C.s | 1 for 1– 15 persons<br>2 for 16– 35 persons<br>3 for 36– 65 persons<br>4 for 66–100 persons<br>From 101–200, add at the rate of 3 per cent<br>For over 200, add at the rate of 2½ per cent |
| Urinals | Nil up to 6 persons<br>1 for 7– 20 persons<br>2 for 21– 45 persons<br>3 for 46–70 persons<br>4 for 71–100 persons<br>From 101–200, add at the rate of 3 per cent<br>For over 200, add at the rate of 2½ per cent |
| Lav. basins or | 1 per 15 up to 105<br>For over 105, add at the rate of 5 per cent |
| Ablution fountains | 1 per 20 persons |
| | *For female personnel* |
| W.C.s | 1 for 1– 12 persons<br>2 for 13–25 persons<br>3 for 26– 40 persons<br>4 for 41– 57 persons<br>5 for 58– 77 persons<br>6 for 78–100 persons<br>From 101–200, add at the rate of 5 per cent<br>For over 200, add at the rate of 4 per cent |
| Lav. basins or | 1 per 15 up to 105<br>For over 105, add at the rate of 5 per cent |
| Ablution fountains | 1 per 20 persons |

*(From British Standard Code of Practice C.P.3—Chapter VII (1950) Engineering and Utility Services).

### Welfare Buildings

The services include canteens or dining-rooms, rest rooms, clubrooms, first-aid departments, dental treatment rooms, etc. Grouped with some of these rooms, for convenience of administration, are sometimes employment offices, medical inspection rooms, staff records office, staff controller's office and rooms for similar purposes, varying with the number of employees and type of factory.

Figs. 14 and 15 illustrate basic relationships of units which form the welfare and staff sections of a factory. These units, in small schemes, are likely to be grouped into one building or even into part of the factory itself but in large establishments considerable space or a large building become necessary.

The services to be provided may be roughly divided into three units: employment services, medical services and dining and recreation facilities. The first is mainly offices dealing with control of staff, employment and pay, and should, therefore, be placed near the administrative offices and the main staff entrance. The time clocks may also be near this unit and controlled by it. The second unit incorporates any medical services considered necessary, such as medical officer's room, with dressing and examination rooms for use in dealing with staff and applicants for employment, first-aid room and rest room, with two beds for each sex if both are employed, a room suitable for eye-testing and a nurses' room. In each of these two units cloakroom and lavatory facilities are needed for the staff of each unit and for employees or public visiting the units.

The third unit is used entirely by employees and is, in many factories, operated and managed largely by a committee of the workers. In large factories this unit has rooms used in the daytime by a group or section of employees, such as male factory hands, female hands or clerical staff as a dining-room. The rooms should be grouped with a central kitchen serving all rooms. The main rooms are frequently divided by movable screens in order to provide a large room for social purposes or smaller rooms for meetings, games, etc. Some factories provide, attached to the canteen, a number of small clubrooms for use of individual sections of the employees. The recreation and dining-room unit should, if possible, have close contact with any playing fields which the factory may possess in its immediate neighbourhood. The cloakroom and lavatories of the factory are sometimes near these units, but if the recreation unit is to be used after working hours there should be additional facilities attached, if the normal factory cloakrooms cannot be close to it.

It must be remembered that the lavatory, cloakroom and bath accommodation is all part of the welfare side of the factory, and a most important part from the point of view of the designer, as it is practically a necessity in all factories, whereas other welfare units may be provided in comparatively few schemes and these mostly of the larger type. The advantages of ample, well-planned, simple provisions for maintaining and improving the health of employees should be impressed on all factory owners by the architect as a safeguard against loss of time due to sickness and uncongenial surroundings.

Fig. 15 shows main units in greater detail and the relationship of the main rooms needed in a moderately large scheme. Larger factories tend to make a much greater study of applicants for employment and if pension and sickness schemes exist, medical examination becomes a necessity. In addition, tests are carried out as to physical and psychological suitability for the particular work required and therefore suitable interview and test rooms have to be provided. The staff records, pay sheets, pay offices, etc., call for an increasing amount of staff time, study and book-keeping and consequently need accommodation which may be better linked to the staff management department than to the general administration offices.

### Canteen

The canteen or dining-room in some form is a requirement in all but the smallest factories. It varies from a small room, in which employees may eat the food they have brought with them, to very large dining-rooms with elaborate facilities for cooking meals for large numbers and where the different branches of the staff have rooms allocated to them: directors, management, clerks, men and women employees. Canteens are essential for workers in all trades where it is dangerous to allow food to be taken into work-rooms.

The simplest type of canteen is a room heated in winter and with some facilities for warming-up food by the employees themselves. As soon as numbers will permit, a mess-room attendant should be employed to clean and look after the room and, in addition, to do simple cooking such as making

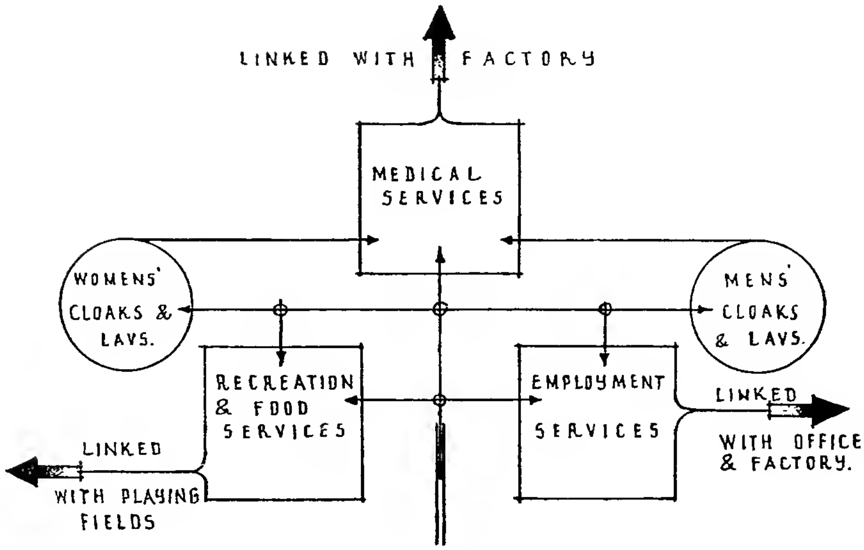



Fig. 14 The welfare unit

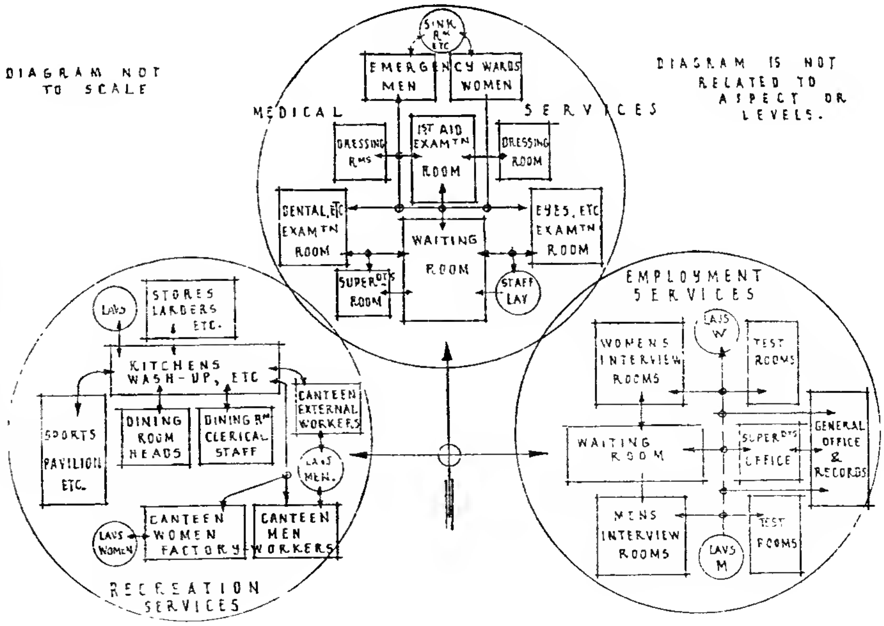



Fig. 15 Welfare units: plan analysis

tea, coffee, etc., and warm up food brought in by each employee.

The size of canteen room or rooms must be based mainly on the number of employees who live too far from the factory to return home to meals, but a large margin should be allowed for fluctuations in these numbers, for in wet or winter weather, more will remain at the works and allowance should be made for possible increase in staff. The floor space required should be based on an allowance of about 10sq. ft. per person in the canteen itself, with addition for kitchen space according to type of catering. This may amount to as much as 70 per cent of the canteen floor space when full cooking facilities are provided for two- or three-course meals in small canteens, decreasing to 50 per cent in large schemes.

The room set aside for meals is the most usual welfare accommodation to be provided ; even the minimum requirements in this direction earn the gratitude of workpeople, but benefits which accrue from the provision of rather more than the minimum are amply repaid, especially in large works, due to better feeding and consequent reduction in lost time due to illness. The essential factors to be dealt with in providing a canteen are convenience of situation and attractiveness, in addition to good food at reasonable prices: even the latter is affected if the layout is bad and sufficient attention is not paid to upkeep expenses. The canteen must be clean, warm in winter and cool in summer, well ventilated and pleasantly decorated. Separate accommodation is sometimes provided for each sex, although it does not seem particularly necessary, since, if the canteen does not exist, both sexes are likely to use the same outside restaurants. It is general to work the dining-rooms on a self-service principle. There is always a preference for tables seating four or, at the most, six persons. Tables for four should be 2ft. 6in. square or 4ft. by 2ft. 3in. minimum.

### Site

It is an advantage if mess rooms can be approached from the factory under cover to avoid the necessity of putting on outdoor clothes in wet weather. If possible, the canteen should be fairly near the cloakrooms and lavatories, to avoid unnecessary duplication of movements and to ensure cleanliness of employees at meals. Since canteen rooms are often used for other purposes, such as games, a club, or for dances after working hours, it is wise to place the building near the street in order that employees need not enter the main factory premises or grounds. Whether in one or more buildings, the unit is probably best placed near the main entrance to the factory.

### Mess Rooms, etc.

When mess rooms only are provided, and workers bring their own food, lockers for cutlery and crockery should be provided in addition to tables and chairs. Seats or benches should be avoided, but if used should have backs and be in short lengths. Wastepaper baskets or containers are essential. Tables should be about 2ft. 6in. wide and in short lengths for four or six persons at each. Good daylight is essential and ample windows should be provided for good cross ventilation. Care should, however, be taken that the kitchen does not ventilate through the canteen.

Dining-rooms, with full provision for cooking and serving meals, require an area of at least 10sq. ft. per person. The kitchen, with necessary larders, stores, an office and staff cloakroom, requires at least 50 per cent of the area of the dining-rooms.

Fig. 16 illustrates typical canteen layouts of different sizes and types. The essential plan factor in relating dining-rooms to kitchens is the provision of sufficient length of service counter and this generally means that the kitchen should be placed on the long side of the dining-room. The table spacing in factory canteens should be based on an allowance of at least 2ft. 3in. run of table per person, using tables about 2ft. 6in. wide; tables should be spaced at least 5ft. apart, with main gangways at least 4ft. wide, and preferably more. Rooms look more attractive if small tables seating four or six persons are used in preference to long tables seating many more, and such a layout appeals more to workpeople.

Fig. 17 illustrates two typical layouts where several rooms have to be served from the one kitchen. Type A has a main room for each sex on each side of the kitchen, and a small room and a servery for directors and heads of departments, for whom service by waitresses may be needed. Type B has one main room divided by a movable screen or partition, both served from one side of the kitchen, which may have a servery if required. In each type direct goods approaches are provided to the kitchens, around which are placed the necessary subsidiary rooms, such as stores, larders, and canteen staff rooms. All entrances to dining-rooms should have draught lobbies as cut-offs. The general structure should be simple, but of good materials, chosen to reduce upkeep to the minimum. Floors are most pleasant if of wood blocks with linoleum or rubber matting in the main gangways.

### Kitchens

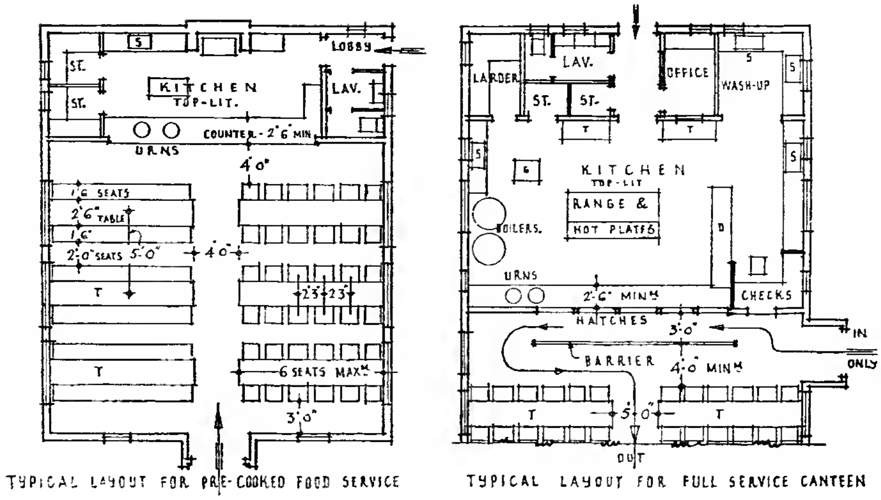
The extent and nature of the kitchen is dependent on the type of service proposed. When food is not being cooked in the kitchen, but only warmed up, much less space is necessary. The main equipment requirements are one or more hot closets or " steamers " for heating up meals, which are best placed near the service counter, so that meals are handled as little as possible between removal from the heater and the waiting workman; each worker's dish or container should have a numbered tally attached to it when handed in for identification. A plentiful supply of hot water is needed for making tea and coffee, or urns should be installed when demand justifies expense. A sink and ample draining boards and drying racks, with good hot and cold water supply and sufficient working space, are essential.

It is fairly general, except in very small factories, to have one person in charge of the canteen or mess room, and also in charge of the building, its cleaning and looking after the heating of the food. A cool larder for storing food brought in by workers is required, in addition to a store-room. This type of kitchen is illustrated in Fig. 16 A. The counter divides kitchen from dining-room, and is used for the urns, etc. It should be constructed in the form of a hatch, in order to cut off the two rooms as much as possible in order to assist ventilation and reduce

the smells of cooking in the dining-room.

Kitchens to provide for cooking food instead of warming-up only need more elaborate equipment, which varies according to the numbers to be catered for. A larder and general store opening into the kitchen are necessary, with suitable racks and shelves, a range, either gas, electric or coal-fired, one or more boilers and steamers, hot cupboards, hot plate, urns and preparation tables. The hot plates may form part of the service counter and urns are also placed on the counter.

Direct delivery access to the kitchen is essential; also canteen staff cloakrooms and lavatories. A typical kitchen of this type is illustrated in Fig. 16 B, which is based on serving a dining-room having about 120 seats. When full service is provided, some provision has to be made for payment by workers for meals, which may be provided in several ways. Some factories charge a flat rate per head for the whole meal, and others charge for each dish or course. If a flat rate is charged, a cashier receives the money at the entrance to the room, or if individual charges are made, the cashier issues tickets, which are handed over the counter in return for the food received, or alternatively a cashier is placed at the exit end of a counter barrier and collects charges according to the contents of each tray. When the cafeteria system is used the worker enters a corridor adjoining the service counter, separated from the main room by a barrier, and collects a tray, with knives, forks, spoons, etc., as necessary, places the tray on the tray rails or rests attached to the counter front, pushes it along past the various food sections, selecting what is wanted and finally passing the cashier, who checks the food selected and makes the necessary charges. The counter is usually about 2ft. 6in. wide, and should be as long as possible. The service gangway between the tray rest and the dividing barrier should be about 3ft. wide in the clear.




A B

Fig. 16 Workers' canteen data

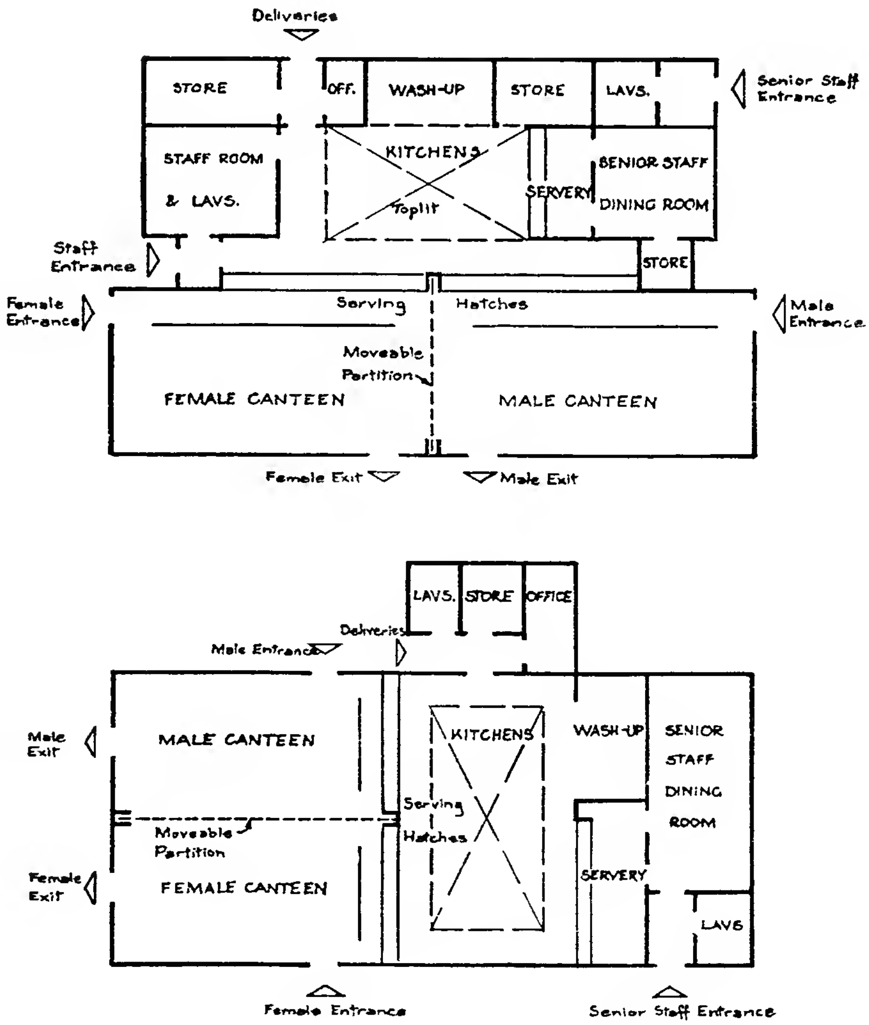



Fig. 17 Typical layout of multiple canteens

### First-aid and Medical Welfare

The medical department varies according to the number of employees, and its size depends on the type of industry and whether extra facilities, as dental treatment, are provided.

There are three main sections of the department: treatment of injuries; medical consultation and care of employees' health, including eye and dental treatment; and physical examination of employees or intending future employees. The location of the department is largely dependent on the first and last sections. If injuries are likely to be severe or numerous, it is advisable that treatment rooms be placed as near workshops as convenient; but if examination of large numbers of would-be employees is involved, the rooms should be placed near the entrance to the works, and near the employment department if one is provided. In all factories where women are employed it is essential that suitable rest rooms be provided, which should be under the care of a nurse (if the numbers of employees can justify the constant employment of such a person) and should be planned to form part of the medical department. These rest rooms should have toilet facilities attached and should be equipped with an adequate number of beds in proportion to female staff numbers. Although numbers do not often permit of a full-time doctor, there is considerable justification for the employment of a nurse, as a great deal of time is often lost through slight injuries becoming septic through not receiving proper attention immediately.

Care should be taken to separate injured employees from persons waiting for medical examination, which cannot always be done by asking intending employees to come at specified times when the works are normally closed or between shift changes; two rooms should therefore be provided for waiting whenever possible. Even in small factories, where both sexes are employed, separate wards are necessary, but one may also serve as the females' rest room. Fig. 18 shows a small first-aid unit comprising an examination room, also used as the nurse's office, and a first-aid room. The unit is placed adjoining the rest room, so that the nurse may control it. A small part of the examination room is screened off to form a waiting space, with fixed seating placed not to interrupt the clear passageway to the first-aid room and movement of stretchers. Larger units may need, in addition, small booths for undressing. The equipment of a small first-aid room is quite simple: cases and cupboards are required for dressings, small equipment and blankets; a sink, a lavatory basin and possibly a small sterilizer, together with an examination table and a bed or couch, must also be provided. The examination room needs a desk and files for use of the nurse, and some seating. If the room is likely to be used for eye-testing, one minimum distance of 21ft. is necessary.

Larger medical departments require space for the following rooms: general waiting room, examination room with at least two dressing booths, one or more treatment rooms for dressing injuries, dental work, etc., two rest or recovery rooms, and an office for doctor or nurse. The rooms do not need to be large, except perhaps the waiting room. Dressing booths may be about 3ft. by 4ft. or 5ft., curtained off from a main room. Beds in the rest rooms are usually 2ft. 6in. wide, and may be placed fairly close together. The equipment of the treatment rooms varies according as injuries are likely to be serious and other hospital facilities far away; some firms consider that it is an economy to have good and sufficient equipment to meet all needs rather than to send employees for outside treatment. Rooms should be planned so that a stretcher may be taken easily from room to room, and doors should in consequence be at least 3ft. 6in. in width. The rooms generally must be well lighted and ventilated and should be pleasantly decorated, especially ordinary rest rooms.

Fig. 19 illustrates a large medical department for a factory employing workers of both sexes, but more particularly of one sex. The normal entrance for persons requiring examination is to a large waiting hall with lavatories for each sex attached; this hall gives access to a dental treatment room and a rest room which might be used in connection with it, or alternatively as a women's rest room attached to the women's lavatory, as shown in the illustration. Opposite this is placed the general examination room, with dressing cubicles along one side, used by different sexes at specified times. Accident cases from the works arrive by a separate entrance, at which an ambulance may be loaded or unloaded under cover directly into a casualty reception or examination room. After preliminary examination the accident cases are taken either into the operating theatre, where further examination or dressing may be performed, or into one of the two wards. The two wards have a sink room and W.C. between, which they use jointly. Adjoining the theatre is a sterilizing room and wash-up. A special point of the plan illustrated is the emergency first-aid store, which has external access; this store is to provide essential materials for use at times (night or overtime shifts) when the main department may be closed. The office is so placed as to control the examination room, waiting hall, and the accident entrance. Some exceptionally large works where many persons are employed now have very large and well-equipped medical departments with the following rooms in addition to those already enumerated: X-ray, foot treatment, a dispensary for issuing medical requirements to workers and a medical laboratory.

Further and more detailed information concerning the equipment of first-aid rooms, together with the essential dimensions is given in the sections on " Clinics and Health Centres."

### Employment Office

In small works no special provision is made in the way of rooms or offices to deal with applicants for employment, but in most large plants it is now usual to set aside a number of rooms, frequently attached to the medical department, for the special purpose of carrying out interviews, proficiency tests and medical examinations. The medical examination rooms have already been discussed, as they are generally grouped with other rooms for medical services. The other rooms include one or sometimes (if both sexes are employed) two waiting rooms with toilet facilities adjoining; also one or two small interview rooms and rooms in which proficiency tests may be carried out (though the interview rooms may be used for this purpose) for office workers on typewriters, calculating machines, etc. If unusual tests are needed, however, a room equipped as a small workshop is

more satisfactory. The employment or staff manager usually has his room in this section, which also includes the time office and pay office, where employment cards, time sheets and complaints are dealt with.

### Other Welfare Facilities

Many and various facilities for assisting employees are provided by some factory owners, such as classrooms for evening lessons or teaching young apprentices, and workshops fitted up for use as a trade school; all these facilities have their own special planning requirements, but, as they are not frequently provided, they are omitted from this section.

Many employers are prepared to spend considerable sums of money to provide welfare facilities for use of employees both during and after working hours, since it has been proved in so many instances that industry benefits very considerably by improved health of employees, loss of time owing to sickness being reduced. Recreational facilities, such as the provision of sports grounds, together with the necessary pavilions, are subjects which are discussed in other sections and have few special requirements resulting from attachment to factories.

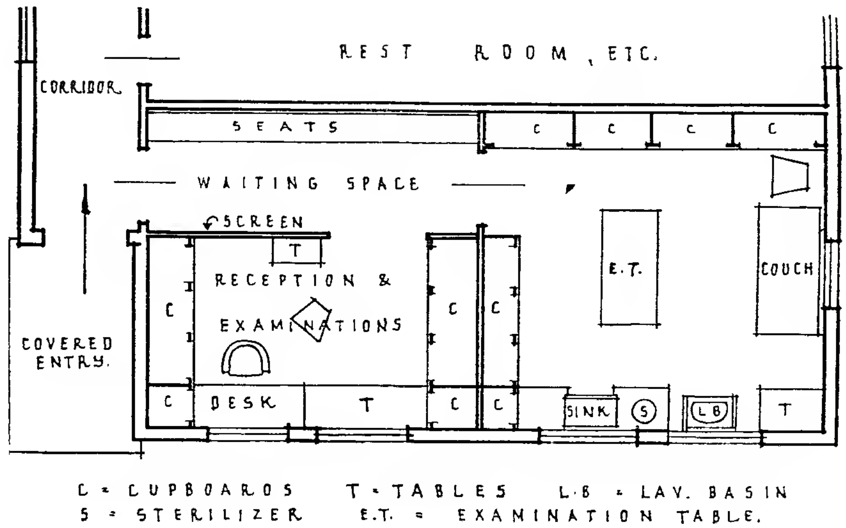



Fig. 18 A small first-aid unit

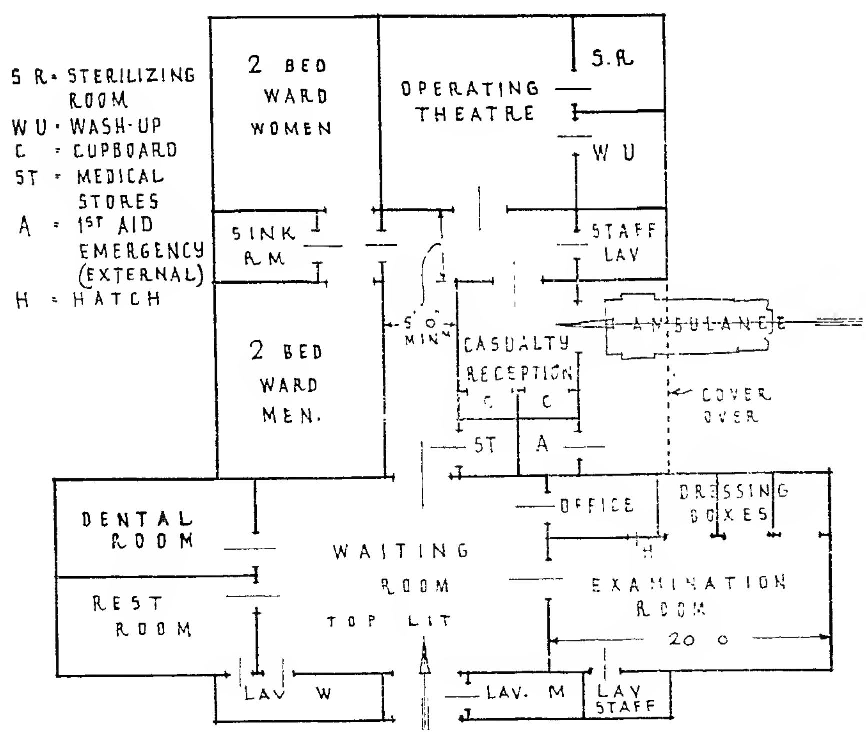



Fig. 19 Diagram of a large first-aid unit

**Power for the Factory**

Power may be represented by steam, gas or electricity together or separately. The first is generally provided by a boiler installation on the site, but gas is more usually purchased from outside supplies except in a few very large factories or where special processes are taking place. Electricity, however, may be produced at the works or purchased at high or low voltage from outside sources. Grouped with the power plant should be the heating and ventilation equipment, which may be quite small or, on the other hand, may need considerable space.

When outside sources of power are used, supplies will, in larger schemes, be supplied "in bulk"; gas in large diameter pipes and electricity at high voltages, each requiring the provision of a suitable meter room or house large enough to take transformers in the case of electricity. Meter and transformer houses are often placed near the point at which main supplies enter the site; they must be separated from other buildings, roads and passageways by fire-resisting walls, doors, etc. If supplies are to be produced on the site, a power house is essential to accommodate boilers, gas retorts or dynamos, according to the power needed. The power house may be only a small boiler room in a basement in a small factory, but in some schemes a large building is involved both in regard to floor area and cubic content, together with all necessary fuel handling and cooling towers.

The placing of the power house in relation to the factory buildings is dependent on various factors, the merits of which must be weighed up in each scheme. These factors are the proximity to rail, road and river for the transport of fuel supplies, the position in the scheme where the greatest consumption of power will be needed (this is of particular importance in the case of steam in order to reduce cost in supply mains, piping and insulation) and the proximity to an adequate water supply for cooling purposes if necessary; a further factor which may have some bearing on the position of the power house, if coal and coke are used, is the direction of the prevailing wind removing smoke.

Fig. 20 illustrates diagrammatically the essential features of a large power plant in which steam is raised for serving electric turbo-generators, for process purposes and for heating the building. The main circulation shown consists of fuel supplies which pass to fuel storage from which the actual boiler furnace supplies are drawn as required, either by hand, by gravity feeding or by automatic stokers; ashes are removed by bins, trucks or travelling belts under the furnaces to an ash dump on the transport side of the building. The boilers which are raising steam at high pressure feed it directly to the factory for process work, to the turbines driving dynamos and to any necessary pumps. The steam after passing the turbines may be required at low pressure for heating the buildings and the hot-water system, either by steam or hot-water calorifiers. Cooling towers or continuous water supplies from rivers are brought to the side of the power house, and in the case of rivers the water is returned after use by separate drainage. The power generated is supplied to the factory either at the voltage generated or is transformed to suitable voltages.

Figs. 21 and 22 show larger factory schemes where steam will be needed for the generation of electrical energy or for purposes of the manufacturing process itself, and illustrate the main principles involved in placing the power unit in relation to the process buildings and fuel delivery. In smaller schemes where sources of heat other than gas or electricity are obtained from outside sources, the main requirements are similar but on a smaller scale. It is essential that fuel is used as near the place of its arrival as possible, to avoid undue handling, even by means of conveyors, hoists and chutes, all of which are costly to operate and are liable sometimes to break down. In large schemes fuel is usually hoisted to elevated coal hoppers or bunkers which feed the furnaces by gravity, or they are stoked by power. Provision has also to be made for the removal of ash from both furnaces and site, the latter often being by methods similar to those used in delivering fuel.

Diagram A, Fig. 21, shows the placing of the power house in relation to two process buildings, which are arranged one on each side of a railway siding also used in the reception of raw materials and possibly the dispatch of finished goods. Two or more railway tracks are required to leave at least one track clear for movement of trucks to process buildings and for removal of empty fuel wagons; one track nearest the power house is used for full fuel wagons which are unloaded in turn by one of various methods into the bunkers. The power house is placed beyond the fuel bunkers, with the cooling towers, if any are needed, on the opposite side of the boilers to the fuel store. Ashes are removed from the side of the power house to trucks on a separate siding which does not interrupt the use of tracks handling fuel and raw materials.

Diagram B, Fig. 21, illustrates a factory layout where fuel, raw material and finished products are partly delivered by railway and partly by water transport. The siding (which may need two or more tracks) passes the main entrances for raw materials and is carried on to the power house for delivery of fuel and removal of ashes if required; the end portions of the tracks being duplicated, or increased in numbers as necessary, to shunt wagons to different tracks. The materials received from river traffic are lifted from ships or barges at the wharf and, in the case of fuel, carried by means of conveyors at a high level directly into bunkers, while goods are handled by other conveyors at the other end of the wharf. All fuel and power house supplies are therefore separated as much as possible from raw materials or finished goods going to and from process buildings.

Fig. 22 shows a power house for an extensive factory with a service of railway sidings, adjoining a main line track not providing much space for the sidings owing to the size of the site. The power house is placed centrally along the range of process buildings and on the railway side, so that supplies of materials to the factory may be separated from the fuel deliveries. The main siding track is continued past the power house to the raw materials entrance of the factory and is subdivided to give standing space for several lines of wagons so that arrival and dispatch of goods may be dealt with at the same time. The diagram also shows provision for a fuel dump where fuel, purchased at advantageous prices, is kept in the open until required for use; it is essential that such a dump be placed where it can be fed to the bunkers with minimum effort, otherwise price-savings are quickly lost in extra handling costs.

## Services and General Considerations

Heating, lighting, ventilation and other services are of the utmost importance in factory buildings to ensure the good health of employees and efficiency of all processes. The necessary installations are here discussed only in so far as special planning requirements are concerned; as, for example, the provision of suitably placed window areas of dimensions adequate for each process. Other considerations, primarily of engineering or structural importance, are considered to be outside the scope of planning and, in the main, can only be covered by saying that sufficient space must be provided to accommodate ducts, fans, conduits, belts, shafting, conveyors, etc. Much information regarding lighting, both by day and artificial light, heating and ventilation is available in pamphlets issued by the Ministry of Labour and by the Building Research Station through H.M. Stationery Office. These and other pamphlets emphasize proper lighting, heating and ventilation. With regard to daylight, it is important that windows generally should be of the maximum dimensions and reach to the ceiling and be so placed that light cannot be obstructed in passing from windows to working surfaces. It is essential that working positions should be carefully planned in relation to light sources. Good artificial lighting must avoid both glare and strong shadows cast on the work itself and must be adequate for the particular type of work under consideration. It may vary greatly according to the material being worked upon and the amount of fine detail involved.

Heating and ventilation usually have to be considered together. Combined systems often prove the most satisfactory, while some processes demand very exact temperature or humidity. Then again, special requirements sometimes arise from the process or operation in each building. The law requires that all factory buildings must be provided with adequate ventilation and heating to ensure, as far as practicable, a pure, fresh and comfortable atmosphere. The Thermal Insulation (Industrial Buildings) Act, 1957, lays down standards of roof insulation for all factory buildings.

Ventilation may be only a matter of providing sufficient areas of windows to open. These in the past have

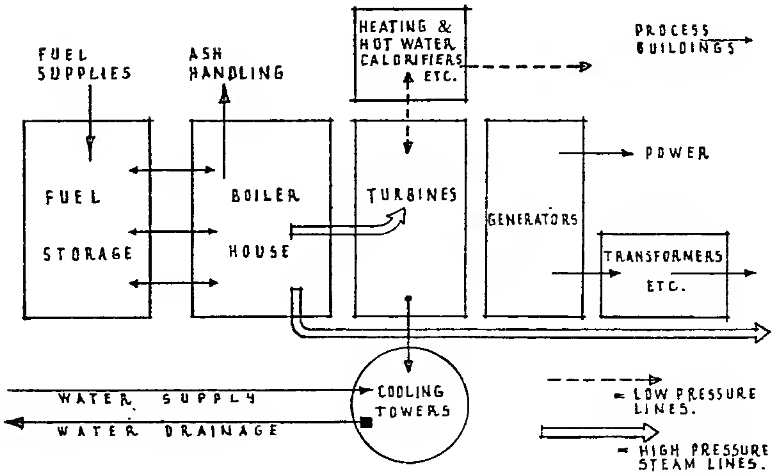



Fig. 20 Plan analysis of the power unit

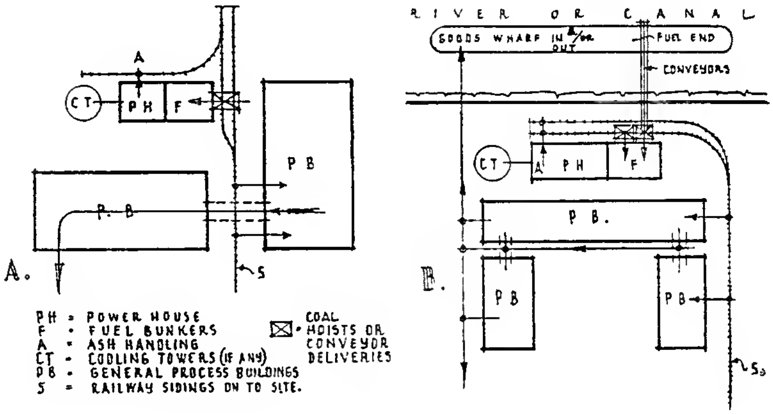



Fig. 21 Placing the power unit in a layout

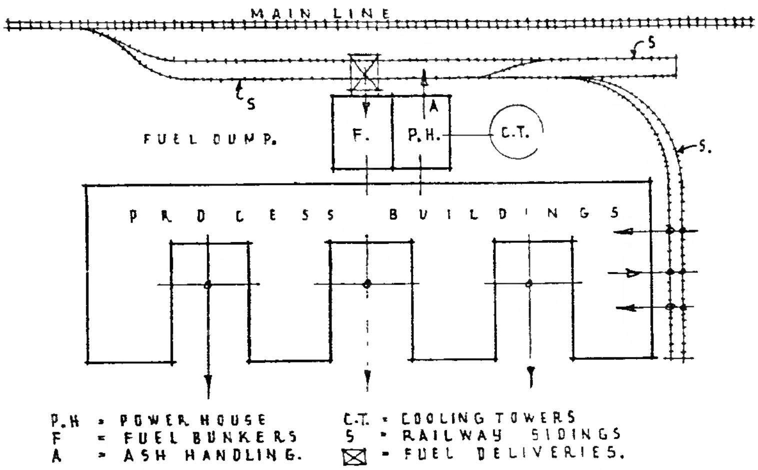



Fig. 22 Placing the power unit in a factory layout

often been far too small; at least 5sq. ft. per 100sq. ft. of floor area should be allowed. On the other hand, ventilation may involve a complicated mechanical system to remove heat and fumes. Six air changes per hour should be assumed as a basis, but in many works more frequent changes are essential. Temperatures to be provided depend frequently on processes, but at least 60° F. should be maintained for workers under normal conditions. Humidity must be considered in relation to temperatures and may have to be carefully controlled in a number of manufacturing processes.

Dust and fume extraction must be carefully planned in association with heating and ventilation systems.

Specialized installations such as telephones, staff location systems and sound distribution systems (" music while you work ") are generally required and all this equipment needs detailed planning consideration in order to provide adequate space in correct positions for the plant involved.

Safety of employees is of the utmost importance and although this is mainly a matter associated with the installation and maintenance of plant and mechanical equipment, all possible care should be taken in planning to facilitate safety measures. Special care should be taken to identify services and pipe lines to reduce danger and to assist speedy repairs (*see* B.S. 1710).

Service pipes and cables must be planned in positions easily accessible for constant maintenance and alteration. It is preferable that these be either fixed on walls or placed in ducts of sizes which permit easy working conditions. Planning of services is of the utmost importance to avoid constant trouble during factory operations. Especially is this true of ducts and " walking-ways " which have to be constructed across or with the direction of service roads; the roofs and access covers of such ducts must be constructed to withstand all possible loads and planned in positions to avoid interruption of traffic when access to service lines is necessary for repairs or inspections.

### Silos

Many factories now employ silos of some description for the storage of raw materials; the containers (or silos) are usually circular, especially when of large dimensions. The circular plan gives great strength at comparatively low cost, but a square or rectangular plan can be used when silos are smaller. Larger circular silos are usually grouped together near the process building in which the raw materials are first required and are filled from the top, feeding the ground floor or basement of the process building by gravity controlled by sliding shutters across hopper openings at the base of the silos. The silos are filled by means of some type of elevator, fitted with suitably shaped continuous running conveyors placed at one side of the silo or group of silos. The materials being lifted to the top level of the silos, they are then conveyed by fixed or movable chutes to the mouths of each container, as shown in Fig. 23. The smaller spaces formed between four large circular silos may also be used for storage of materials as desired. Smaller silos, which may be square or circular in shape, may be accommodated on upper floors of buildings in the same way as water tanks. Raw materials may thus be fed to upper floors of a multi-storied process building. This method is, however, not possible with large silos as the latter must stand on the ground, and the contents must be lifted again for use in multi-story factories.

Fig. 23 illustrates two type plans showing the grouping of circular silos (A) and of square silos (B), together with conveyors for hoisting the materials to be stored. The figure also shows two typical sections through silos stressing the relationship of the bottom outlets to the ground level and the process building. In Diagram C, the outlets, being at about ground level, necessitate excavating below ground level for the conveyors to feed the factory, which also has to have some part at basement level to receive the contents of the silos, even if they have to be lifted to the top floor level for commencement of the process. This type of section becomes advantageous when it is necessary to excavate the ground owing to its lack of supporting strength for the structure over, and the length of the conveyors in the elevator tower is reduced. The machinery for the conveyors is generally at the bottom of the conveyor tower, which is therefore below ground level in this example.

The section in Diagram D shows the silos raised above ground level on supports so that the hoppers are raised high enough above ground level to feed into the ground floor of the building by gravity, chutes, or trucks. Sufficient height must be provided in each case at the top of the silos to house the distribution conveyors which pass the materials from the hoisting conveyor to the mouths of the silos. Large silos are generally constructed of reinforced concrete, but smaller ones sometimes of metal.

### Warehouses

Warehouses or store buildings are required in conjunction with many factory buildings, especially for the storage and packing of finished articles. Frequently they do not require much window area as light is not needed, and is in some instances definitely undesirable. Floor heights need not be more than 7ft. 6in., or 8ft. for efficiency, as articles stored at greater heights are out of normal reach. In many warehouses heavy loads have to be dealt with, requiring thick floors and large supports, the latter having to be carefully arranged not to interfere with the best layout of storage spaces. In some processes packing takes place before storage, either in whole or in part, but in many others the packing is not required until the moment of dispatch; thus, time of packing in relation to process of manufacture has much influence on the position of packing space in relation to storage.

Fig. 24 illustrates (Diagrams A and B) two plans of warehouses where, after storage, packing takes place immediately prior to dispatch from the warehouse. Type A, together with section C, shows the whole of the ground-floor area devoted to packing and dispatch, the latter being by means of road vehicles only; while Type B, with section D, shows a similar layout, dispatch in this case being partly by road on one side and partly by rail on the other side of the warehouse. In Type A, hoists or lifts bring goods from upper floors to ground floor in such a position that goods which need packing are taken to one side to be dealt with while others are loaded directly into lorries or stacked on the loading platform. Section C shows the first-floor level placed in relation to the ground level to provide clear height of 16ft. for lorries, but the ground-

floor level is placed at loading-dock height, namely, about 3ft. above road level. Type B has the hoists placed to each side so that a clear space for loading is left between railway dock and lorry-loading dock. Packing space is provided round each pair of hoists. It is generally advantageous to place hoists or lifts in pairs. This saves waiting and consequent loss of time, and prevents disorganization due to temporary breakdowns.

It should be noted that in most schemes railway trucks cannot easily be brought inside the building but must be loaded, as shown, from a platform along the side of the warehouse. This should have a cantilevered roof as a protection.

**Laboratories**

Many factories require research and/or testing laboratories. The accommodation may involve one small and simply fitted room, a large department, or even a separate building. Neither the size nor equipment is in any way standardized, and therefore presents far too many problems to be considered fully in this section.

From the factory point of view the main points affecting planning are as follows: the laboratory should be placed in a suitable position in relation to any part of the factory which has to be referred to constantly by those working in the laboratories. The accommodation, however large or small, should be well lighted and ventilated and, if possible, have a northern aspect, quietness, freedom from vibration and be so placed that any services, such as heat, electricity, gas, steam, compressed air, etc., may be easily provided. Laboratories for research are very frequently grouped with the office accommodation, and may be placed advantageously on upper floors of office buildings.

An experimental workshop, if needed, is frequently placed in very close proximity to research workers, as these two sections generally have to work together.

Process testing laboratories may have to be distributed in one or more places in the process buildings, their positions being dependent on the actual work of the factory; frequently these are only small areas divided off from the manufacturing process by screens or division walls.

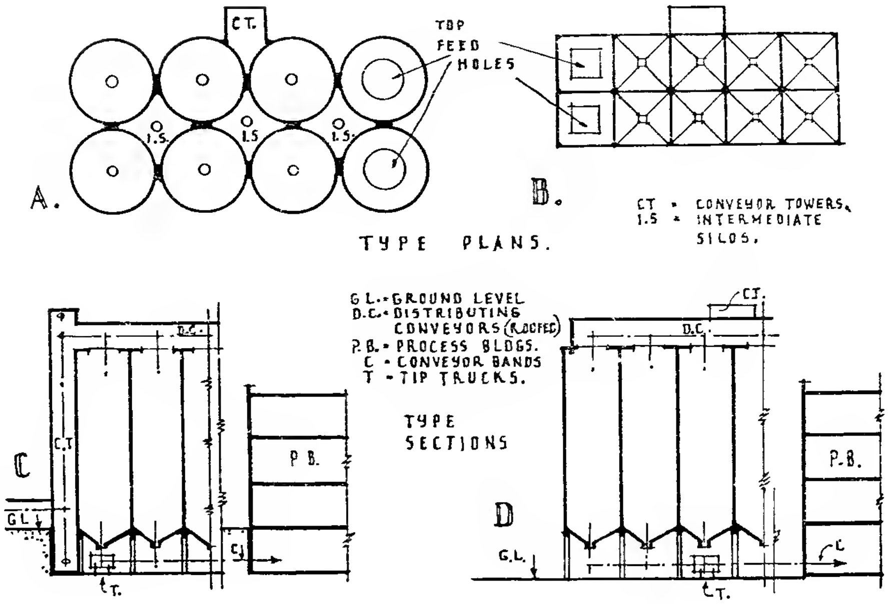



Fig. 23 Silo storage

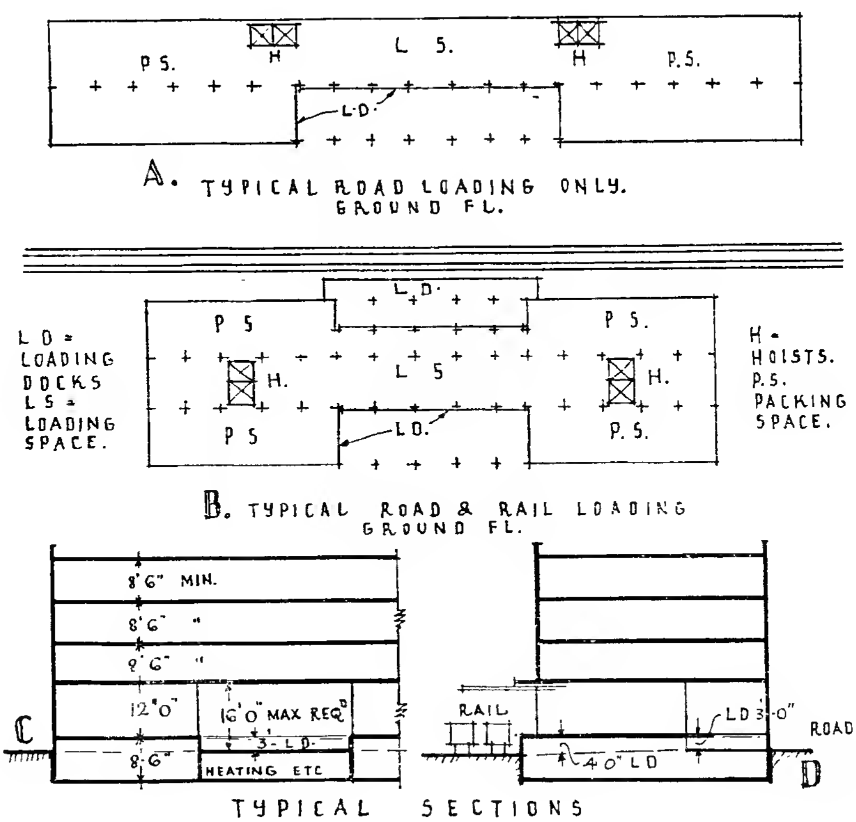



Fig. 24 Warehouses

### Offices

The amount of office accommodation required at a factory varies considerably; sometimes offices for the sales staff are at the factory, whereas in other schemes these, together with all general management, are separated and placed some distance away or may be situated even in a distant town. All factories, however, need a clerical staff, together with private offices for the works manager and other important members of the staff. This accommodation, if small, usually occupies a minor part of the ground-floor area of the factory, nearest the main entrance, and if it is large, should have either a small separate building or some part of a building near the works entrance. Space on a first floor or mezzanine is often used for offices in single-story works or process buildings. The works manager should always be allotted accommodation where he has easy access to all parts of the factory. Offices for foremen, etc., have to be provided in the shops, but usually consist merely of areas of floor space on the production floors in each shop, simply screened off, very frequently by glazed partitions. These small offices are often placed against internal walls or in the central parts of floor space, as daylight is more valuable for machine and process work and the foreman only occupies the office at intervals during the working day. If there is a fairly large office block of several floors attached to a factory, the most satisfactory placing of groups of offices appears to be: offices dealing with works matters, such as employment, pay and works manager, on the ground floor; general management and sales offices on the first floor, and laboratories, research rooms, records, drawing offices, etc., on the upper floors. (*See also* section: "Office Buildings.")

### The Entrance

The planning of the entrance to a factory group is of the utmost importance to ensure efficiency of working. Ample space must be allowed for a number of persons to enter in a short time, deposit clothes, house bicycles and clock-in, with the minimum of congestion and loss of time. Equally, transport entering and leaving the site has to be controlled and directed

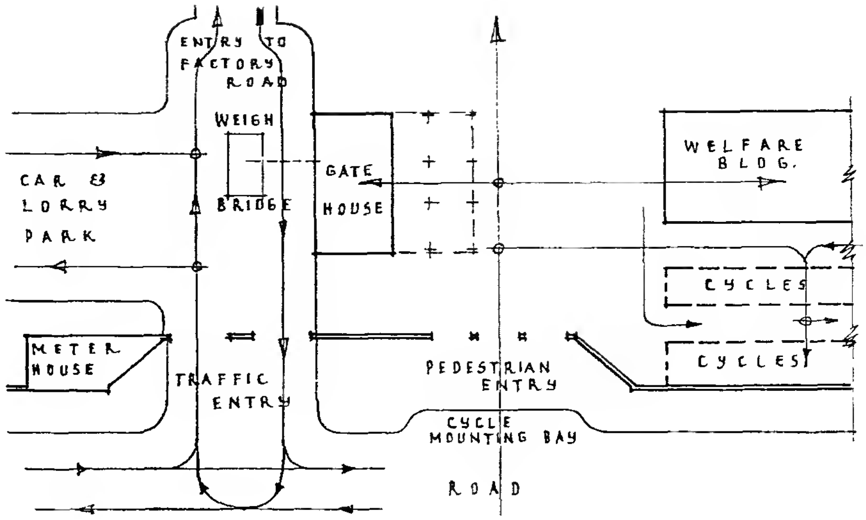



Fig. 25 The entrance

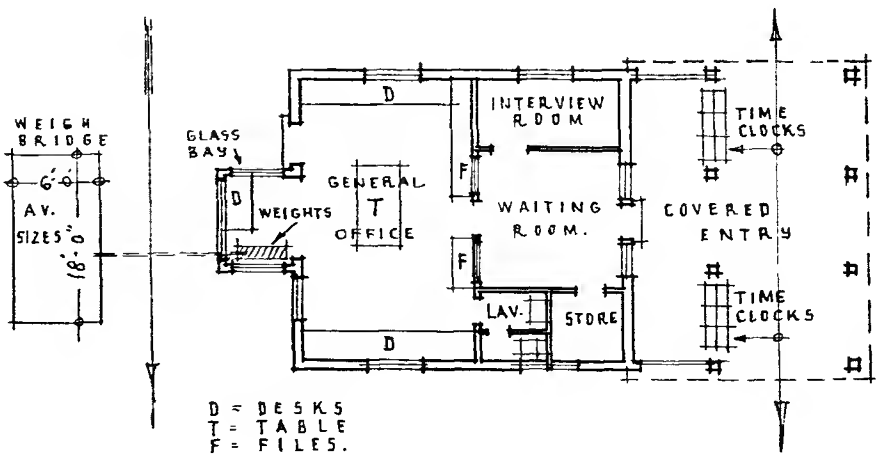



Fig. 26 A typical gatehouse

and must not interfere with employees' entrances. It is wise to set back boundary walls or fences at the entrances to give space for the pedestrians to pause before, or after, leaving the factory premises and also to improve angles of vision of lorry drivers leaving the vehicular entrance, as shown in Fig. 25. The figure also illustrates clearly the separation of vehicles and pedestrians as they enter the site by different gateways placed on either hand of the control building or gatehouse.

Employees or visitors must pass the control building, where visitors may make inquiries and employees clock-in before passing to the welfare building or cloakrooms. Cycle sheds should be so placed that employees leave machines before passing the time clocks, which are grouped at the gatehouse and placed under cover. Vehicular traffic should enter the site separately and pass over the weigh-bridge which is controlled from the gatehouse, before proceeding to the factory buildings. Provision should be made, and be under the supervision of the gatehouse, for car and lorry parking before passing the weigh-bridge. Traffic, should, after leaving the factory building, repass the weigh-bridge and gatehouse before leaving the site. At the entrance to the factory is often placed the meter-house in which are assembled the various meter-rooms, one for each service, separated from one another by incombustible materials, although all meters can advantageously be grouped together under one roof.

Fig. 26 illustrates in greater detail a typical gatehouse building which controls everything entering or leaving the site. The accommodation provides covered space for employees waiting turns at the time-recording clocks, which are placed in two groups, a waiting room for visitors and a small interview room where foremen or members of the management may interview visitors without the latter entering the factory buildings or offices. There is also a general office in which accommodation is provided for the machinery part of the weigh-bridge, and checker's desk, also table space, desks and files for dealing with records from time-recording clocks, visitors, deliveries and dispatches. This general office has a bay window giving a clear view of the approaches to the weigh-bridge, both from the main road and from the factory buildings. In this bay window should be a hatch through which way-bills, etc., can be handed in and out, but, in addition, a door from the office to the weigh-bridge is required.

The remainder of the accommodation shown on this figure includes a lavatory for the office staff and a small store for time sheets and stationery. The weigh-bridge should be so placed that all vehicles may use it in either direction, if required, but also that vehicles can pass it on either side on the main traffic lines when its use is not required. Weigh-bridges are sunk into the roadway, so as to be level with the normal carriageway, the mechanical apparatus being controlled by underground mechanism from the gatehouse. The size of apparatus is controlled by anticipated loads and vehicle sizes, but average dimensions are 6ft. wide and 18ft. long.

**Parking Space**

Open-air parking space is required adjoining factory buildings for visitors and in many schemes it is necessary also to provide parking space for the vehicles of staff and employees. Such spaces should be placed where they may be overlooked by the gatehouse or doorkeeper. Each group should be kept separate. Garages are usually wanted for vehicles owned and operated by the firm and these may comprise both goods and passenger types. (*See also* Part 1: Transport, for details of parking cars, motor cycles, bicycles and other vehicles.)

## Sites

The architect seldom has much influence in the purchasing of sites for offices, especially in town areas, but is usually called in to make the most advantageous design for a site already bought by a firm for its own use or for development as a financial proposition. The aspect of offices is of little importance except when open country sites are under consideration and advantages of sunshine or prospect can be used for important rooms, and special aspects can be selected for rooms such as laboratories and drawing offices.

Country sites do not present more than normal planning problems which call for few comments; adequate circulations, both horizontal and vertical, are important, together with sufficient light for all rooms and proper lighting and ventilation for corridors.

Congested urban sites, however, may have many planning problems; except on large open sites street frontage lines are generally built up as illustrated on Fig. 1, Diagrams A, B, C and D. On large sites alternative plan types may be adopted as shown on Fig. 1 E, where the building has wings radiating from a centralized vertical circulation which eliminates internal light-wells and frequently improves letting values, as light and air in such offices is often better than in enclosed courts, unless the latter are exceptionally large or have strong bearing on the economical development of a given site.

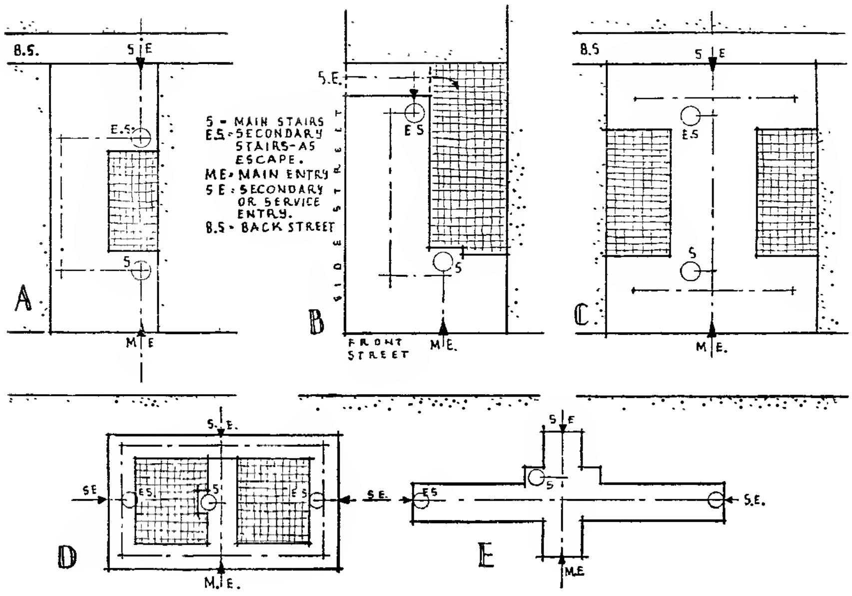



Fig. 1 The site and general layout

Fig. 1, Diagram A, illustrates a site with a narrow frontage to each of two streets, one more important than the other, which has a direct influence on the planning of the main vertical circulations. Such a site can only be developed by having a block of buildings equal to the width of two offices with a corridor between placed on each frontage with a connecting link made up of one office width and a corridor width which obtains its light from an internal area or light well; the size of the latter is governed by building regulations or reasonable light requirements.

The amount of floor area is also governed in most instances by a floor space index and the amount of building area allowed by a coverage limitation, both laid down by the local Planning Authority under the Town and Country Planning Act. Secondary access is most important and sites should be chosen wherever possible with two street frontages; these secondary entrances are not only needed for deliveries and services but also to act as secondary means of escape to conform to many fire escape requirements. When a second street frontage is not available it may be necessary for a secondary entrance (and escape) to be on the main frontage, treated in such a manner that there may be no confusion as to which is the main entrance. In some schemes the areas shown will not, or need not, go to the lowest floors, particularly where shops or showrooms are provided on the ground floor and basement levels.

It is becoming increasingly necessary to consider vehicular access on the site, apart from the parking of vehicles, for all deliveries of goods to the building and the offices in it. If regulations requiring all deliveries to be made within the area of sites extend, sites with small frontages will have to devote a large part of the ground-floor site area to these purposes; this will have a great influence on the planning of main and secondary entrances, particularly on sites with one street frontage only; some 10ft. will be needed for a vehicular entrance to the site.

The plan in Diagram A requires a frontage of about 36ft. to provide an area of reasonable width for a building having several storeys, on the assumption that an office and corridor require with enclosing walls about 26ft., as discussed later.

Diagram B, Fig. 1, illustrates a corner site having one frontage with the main entrance and the other frontage to a side street with a secondary entrance and access to a service area or yard. This plan can be used for a site having about 60ft. minimum width to the main street, although about 70ft. would be much more satisfactory. The building on both frontages is based on the use of a central corridor. Vertical circulation is very straightforward in this type of plan, with the main staircase and lifts in the block on the main frontage with a secondary staircase at the opposite end of the site delivering to the service entrance.

The plan in Diagram C has a main frontage and a frontage to a secondary street; the remaining boundaries have property adjoining. The most economical development is by double width blocks with central corridor on both frontages and as a connection spine, the rooms in the connecting unit being lighted from wells adjoining the site boundaries. The minimum site width for a plan of this type is about 80ft., unless the building has many floors, when the light wells will need to be increased in width. The placing of

staircases depends somewhat on the length of the blocks on the street frontages and whether the space occupying these wings is used as large open offices or as a number of small rooms. If the wings are short or occupied by open offices, the staircases may be placed as shown in the diagram, but if long or divided into small offices, additional staircases at the ends of the wings may become necessary for adequate means of escape in case of fire.

The placing of staircases also arises in plans of the type shown in Diagram E; the long wings to the left and right of the central block will need staircases near the ends, but the short wings adjoining the central block can probably be served by a single main staircase as shown, and extra staircases would only be needed if the short wings were considerably lengthened.

The plan in Diagram D can usually be handled with a central staircase and secondary escape staircase in each of the other two main blocks, but if a distance to any staircase is more than about 80ft. from an office door, additional staircases may be needed. Additional staircases in larger buildings serve not only for escape purposes but also aid general circulation, as horizontal movement between one office and another may become great if the main staircase or lifts have to be used for each journey. It is important, however, that all rooms are available from the main entrance as well as from secondary entrances, especially in buildings leased in small units as lettable offices.

### Framing Grid

Planning of all multi-storeyed office buildings depends on the basic grid layout adopted for framing. whether the construction has brick or stone piers or steel or concrete framing. Units are based on the most economical development for each site and on whether the lower floors are to be used as offices or for other purposes such as shops or showrooms. If shops are to be planned on the ground floor the type adopted has considerable bearing on the most desirable unit of frontage needed; some districts may require shops based on units of about 18ft. frontage which can be let as one shop or if necessary may be subdivided into two units of 9ft. each, which is about as small as is desirable. If shops of other sizes such as 10ft. to 14ft. frontage are to be accommodated, the upper floors to be used as offices should be based on a grid layout of the same dimensions. 20ft. frontage should be considered as the maximum bay unit of frontage but this is likely to be far less economical than bay sizes of 12ft. to 15ft. span. These bays are partially dependent for economy of construction on the length of the span from the supports on the frontage to the next intermediate row of supports as the two dimensions of the floor jointly control its thickness. Large spans necessitate deeper beams which influence the floor to floor heights which, when totalled together, are often controlled by local building regulations.

Fig. 2 illustrates five typical grid spacings. Type A illustrates 18ft. frontage spacing suitable for shops on the ground floor with offices over which can be subdivided, if the windows are suitably spaced, into two small offices in each bay which allows, after deducting partitions, rooms about 8ft. 6in. wide. The spacing of supports across the block is based on duplicating the piers or stanchions on each side of a central corridor; the depth of the offices on both sides of the corridor is based on a span of 20ft., with the width of the corridor as 5ft. Except with very large windows (which cannot exceed, in the London County Council area, 50 per cent of the wall area) or on very open sites, greater depths from window walls than 20ft. are of little value. There are many examples of offices having greater depths than 20ft., but of very few can it be said that the daylight is adequate, taking into account average weather in this country.

A spacing of supports as illustrated in Fig. 2, Diagrams B, C and E, shows special consideration for offices overlooking courtyards; unless courtyards or light wells are of unusual widths and the walls treated to reflect the maximum amount of light, the offices cannot be considered as having equal advantages to those having windows on external frontages.

These three diagrams are based on maximum depths of rooms from courtyard window wall of 15ft. instead of 20ft. as suggested for rooms with windows on to main frontages. These reduced room depths are also desirable for rooms on external frontages on very narrow streets. To obtain this reduced bay depth it is often economical to space intermediate supports on one side of the corridor, thus the supports are placed centrally in the block as shown in Fig. 2, Diagrams B, C and E.

Diagrams A, B and C are all controlled by the provision of shops on the ground floor; Types A and B are based on 18ft. units of frontage, but Type C is based on units of 15ft. on the ground floor for shop purposes, and divided above each with supports picked up over the shop fronts giving 7ft. 6in. wide office units which is as small as is useful for any purpose.

The grid principle should be maintained carefully throughout a plan, especially for lettable offices in which the ultimate division of office spaces is unknown, and consequently all partitions are movable but must be capable of economical arrangement in a variety of ways to suit the individual firm's own requirements.

Diagrams D and E are based on the assumption that shops will not be required or that units of 12ft. to 15ft. can be adopted for ground-floor lettings other than offices. Grids which give very small room units (7ft. 6in. to 9ft. centres) are suitable for many purposes, but generally it seems that larger units are better since the resultant room shapes are more readily adapted to furniture layout.

### Height Limitations

Fig. 3 illustrates two typical sections based on plans shown in Diagrams B and A of Fig. 2. These sections are drawn in conformity with London County Council regulations which limit the vertical wall height in the widest streets to 80ft. from the pavement and allow two additional storeys either set back or constructed in the roof within an angle of 75° with an overall maximum height of 100ft. above the pavement. It should be noted that the number of storeys in each diagram is different; Diagram A has ten floors including ground floor, and Diagram B only nine floors; all floors have been made the same height floor to floor in each diagram. A height of 10ft. from floor to floor is about the minimum that should be used to provide proper headroom under beams and adequate lighting in offices, more particularly on lower floors in congested districts. The advantages of each type of section

are: first, in Type A the extra storey in the allotted overall height provides greatly increased lettable or usable floor space, but bearing in mind the average angle of the sun (in London as shown on the figure), the floor area receiving direct sunshine is much less than in Diagram B where floor heights are greater. The greater height in rooms permits increased spans while still maintaining an equal amount of sunlight which probably offsets the advantage of floor space gained by the extra storey of Type A.

Type A shows a section based on a single row of supports in the centre of the total overall width of the building, and the corridor (if any) width deducted from rooms on the courtyard frontage. Diagram B has a double row of intermediate supports on each side of a central corridor. These two sections also illustrate the two main alternative methods of setting back above the 80ft. high parapet level. On the left-hand side of each section the walls of each of the two top storeys are set back, thus maintaining vertical external walls, while the right-hand sides show sloping roofs with dormer windows. The merits of these two alternatives are difficult to assess; the dormer window type gives extra floor space, but as this is partially covered by sloping ceiling it is not of full value. The vertical walls are probably easier to maintain, but less economical from a constructional point of view as they involve point loads set back from main supports.

Office buildings are controlled by local building regulations, which may govern heights and any setting back of storeys that may be required. For example, Fig. 4 illustrates the effect of the L.C.C. regulations which limit the vertical height of external walls to 80ft., measured at the centre of the frontage, or to less height, according to the width of the street on to which the building abuts. Buildings on corner sites are regulated for a distance of 40ft. on the return frontage by the height permitted on the main frontage. In addition to the vertical height of 80ft. two storeys may be erected in the roof, but must be contained within an angle of 75° as shown on Fig. 4, although special architectural features may be allowed outside this angle. These upper storeys may, as previously stated, either be in the form of pitched roof or of set-back vertical walls. It should be noted carefully that dormer windows, open

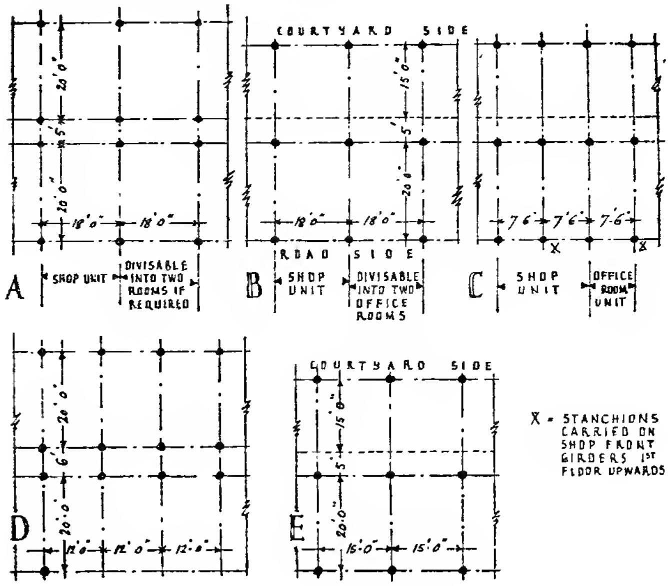
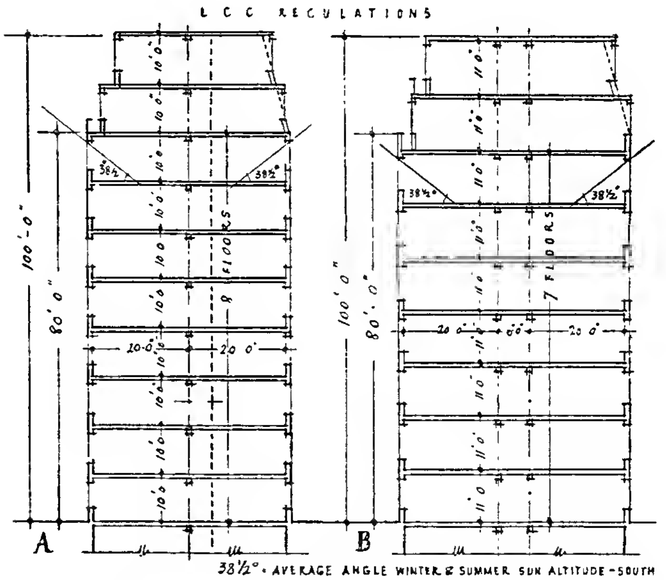
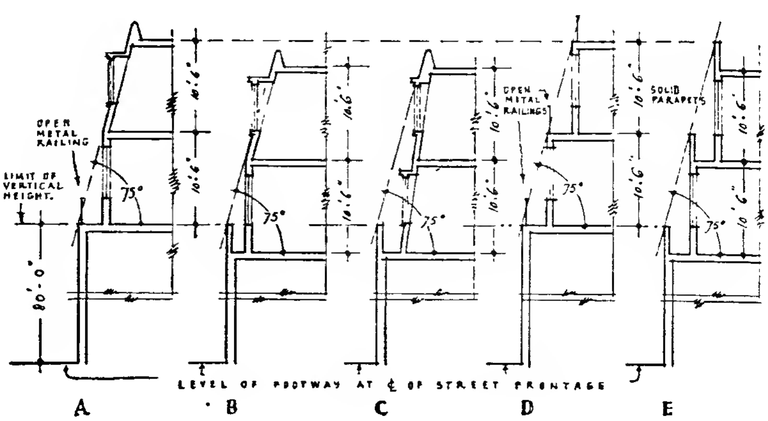



Fig. 2 Framing grid layout




Above: Fig. 3 Height limitations, etc. Below: Fig. 4 Maximum height of buildings



metal railings being architectural features, are not controlled by the Act and need not be placed within the prescribed angle; nor is the maximum length of the dormer windows laid down and they may therefore extend along the greater part of the frontage.

Buildings higher than the regulation 100ft. may be permitted in many cases where high blocks are well set back from street frontages on large sites. The heights allowed may then be governed by angles of light to either site boundaries or to adjoining properties or to blocks on the same site or to all three. Such high developments are usually controlled by the factors of (a) site coverage or floor space index or (b) area or regional controls exercised under a general development plan for any district as established under the Town and Country Planning Act. Permission to develop high buildings is, therefore, very much a matter to be decided for each case on its merits by the Local Planning Authority.

### Entrances

The entrance is dependent on whether offices occupy the whole building, whether there are shops or showrooms on lower floors, or whether the building is mainly or entirely occupied by one firm. In those buildings devoted entirely to one firm the entrance should be in a prominent position and is generally of more ample size than in lettable offices, or in cases where the entrance has to be arranged among a series of shops. The main entrance should be on the most important street if the building has several frontages, even at the expense of lost shop frontage. Except in small suites of offices, each let separately, and over shops, the entrance should provide space for lifts, main staircase, porter's box and often in addition notice boards, a letter chute and a staircase to basement, where communal services such as heating are to be controlled by the porters.

One entrance only to lettable offices is sufficient (although, of course, there will be service entrances or escape exits in addition), unless the building is very large or there are special conditions—such as one firm occupying a part of the building and letting off the remainder—which may necessitate two entrances. Reduction of the number of entrances economizes in porters and lift attendants, and generally assists proper supervision of all persons entering and leaving the building.

Access to floors placed over shops is also discussed to some extent in the section entitled "Shops and Stores," but when such upper floors are to be let as offices apart from the shops, as opposed to flats for the shopkeepers or offices in connection with the shops, entrances should be placed in positions which may be seen easily and should not be inside shop frontage lines or behind display windows. Except in large blocks of offices, where the offices are as important as the shops, office entrances have to be reduced to minimum sizes in order not to occupy valuable shop space; when the first floor level is reached an entrance hall can be formed if needed. One entrance of this type should be sufficient to provide for offices over at least two shops, thus reducing the loss of shop frontage to a minimum; by the use of corridors the whole space over a block of shops may be served by one entrance.

It often happens, however, that when a building in a street is demolished and rebuilt with one or perhaps two shops on the ground floor, the upper floors are not required for purposes connected with the shops and therefore become available for lettable offices; these offices have to be approached by a staircase and a small entrance occupying a part of the frontage. In such examples staircases should not be less than 3ft. wide in the clear, and the space at the entrance door on the street level should be large enough for two persons to stand comfortably while the door is being opened, that is to say there should be about 6ft. from the door frame to the first riser face of the staircase. It is always desirable to have two doors at the entrance, the outer one for night use and the inner one (preferably glazed) for daytime purposes. Offices in buildings of this type do not as a rule have more than two or three floors, and often are not equipped with lifts.

Fig. 5 illustrates a typical entrance to a building used entirely for office purposes. The entrance is in the centre of two wings with a connection on the central axis to a similar block at right angles to the main frontage. Essential circulations are fixed by the corridors in each block which should be maintained on all floors without interruption by lifts or staircases. The main entrance corridor from the street to the lifts and staircase should have a width of at least 8ft., and in large buildings this width should be considerably increased; for normal eight- or ten-storied blocks of this type, 12ft. should be considered as a minimum main entrance vestibule width. It should be noted that the entrance doors are duplicated to form a draught lobby and outer doors are set back from the frontage in order to provide any necessary steps from pavement to ground-floor level without obstructing the footway. The staircase commences in a position in which the first steps are easily seen on entering the building while the battery of lifts is placed on the opposite side of the same widened waiting space; some such widening is desirable in front of all lifts and staircases on all floors to avoid congestion. The planning of staircases and lifts must always be considered in relation to upper floors, so that there is repetition on each floor of the staircase and corridor approaches.

The shape of the light well should be noticed, as it is desirable that some daylight should be available on the main staircase and in some administrative areas this is an essential requirement under bye-laws.

Staircases and lifts should be grouped together whenever possible and should be planned to be as obvious as the main horizontal circulations will at any level permit.

Figs. 6 and 7 illustrate two typical office entrance halls and the relationship of lifts and staircases to corridors at upper floor levels. Each example shows shops on the ground floor, but this could be office space. Fig. 6 has an entrance on the end of a building adjoining an external or party wall, in which case the lifts and, if required, the staircase, may be spread along the boundary wall without interrupting upper corridor circulations, whereas in Fig. 7 the entrance hall has corridors on each side at all upper floor levels; in consequence the lifts and staircase are placed beyond the main corridors and are thus grouped round a lift lobby, which allows the space over the entrance itself to be used as offices on all upper floors.

### Lifts

The number, size and conditions for lifts are given in Part 1: Circulation.

## Escapes

Alternative means of escape in case of fire are required in all parts of office buildings except in very small buildings which may be only two or three storeys high. Local regulations generally lay down definite requirements regarding the number, type and positions of escape staircases. These may either consist of a second staircase within the building or an external staircase. In the L.C.C. area the width is determined by the London Building Act, which requires a minimum of 3ft. 6in. if not more than 200 persons are accommodated in the building, but if the number exceeds 200, 4ft. 6in. must be allowed with an addition of 6in. extra per hundred persons over 400; all doors must open outwards in the direction of escape and must permit a clear passage way of the minimum width necessary.

Fire-escape staircases placed within buildings must be enclosed and have proper cut-off doors at each floor level; staircases and enclosing materials, including all glazed screens and doors opening upon the staircase, must be fire-resisting. When open external staircases are used, all windows adjoining may be required to be fixed and glazed with wired glass; doors leading to external staircases must be fire-resisting and hung to open clear of the staircase. Great care must be taken so that the position of escape stairs at ground level is such that immediate delivery to the street is easily available and, when the site permits, these should have access to streets other than that from which the main entrance is approached.

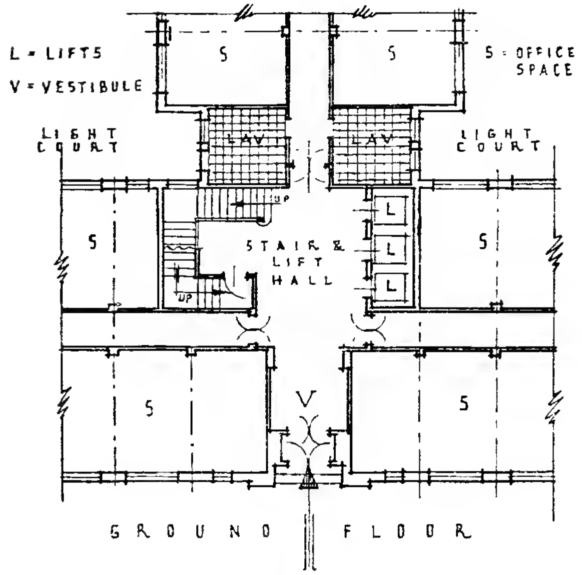
Other information relating to escape staircases is given in Part 1: Circulation and in the sections on "Shops," "Factories" and "Municipal Buildings."

## Mats

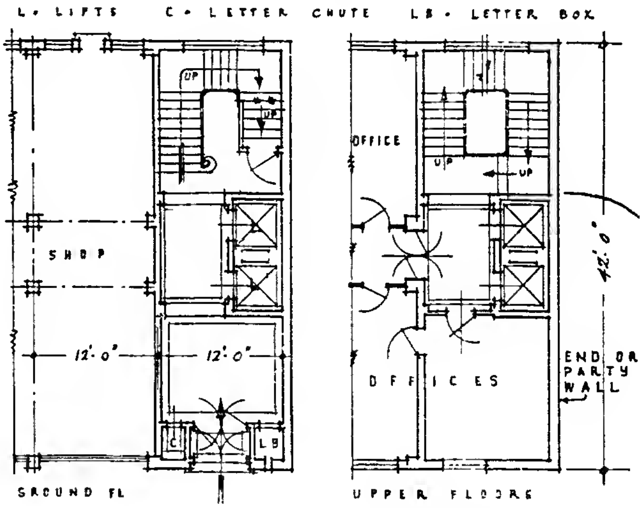
Proper provision should be made in all entrances for mats; these should be large, occupying at least the full door openings, and having a width of at least 2ft. 6in. and, preferably rather more.

Mat-wells should be placed inside the inner pair of draught doors when these are provided, as the outer set generally is continuously open during office hours.

Fig. 5 Main entrances




Below right: Fig. 6 Vertical circulation



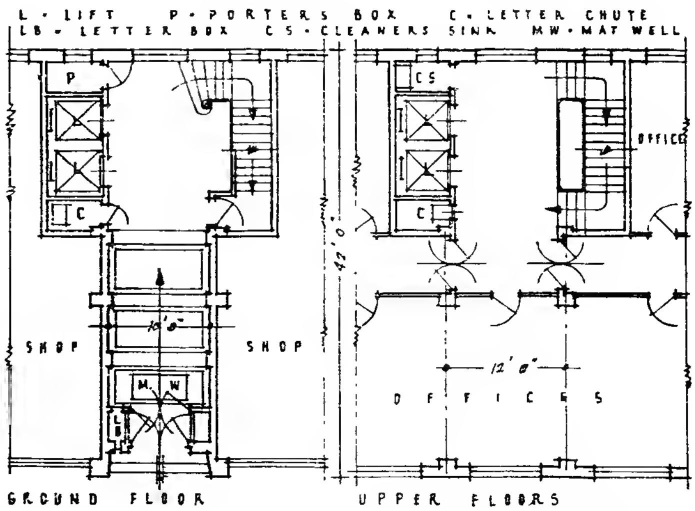




Fig. 7 Vertical circulation

## PORTERS, LETTERS, NOTICE BOARDS, ADDITIONAL LETTABLE SPACE, CORRIDORS

### Porters

Most offices require provision for a porter in the entrance hall, usually an enclosure which can be locked; in the enclosure storage space should be provided in the form of pigeon holes for letters, racks for keys and shelves for parcels. When all the offices in a building are in the same occupation, the porters often deal with all enquiries and need considerable counter space; they sometimes have charge also of the switchboard of the telephone system if this is not so large that it requires a full-time operator. In small buildings an enclosure about 15sq. ft. or 20sq. ft. in area is often sufficient, but in large buildings a special room is often necessary, having an area of 70sq. ft. or 80sq. ft. or more.

### Delivery and Dispatch of Letters

By arrangement with the G.P.O. a collection box may be installed in larger blocks of offices, and this should be placed in the entrance hall. In large buildings postal chutes connecting all upper floors with the box on the ground floor are often installed; these should be placed, when possible, in or near the lift lobby on each floor. Postal chutes need a fairly straight and direct drop. The space required is small on upper floors, being about 12in. by 3in.

In some large offices in one occupation a postal dispatch room is required, where all letters are delivered from the various floors of the building by means of a postal chute; the Post Office then arranges to collect letters in mail bags from this room.

Letter boxes should be provided in all offices, for use when the main doors are closed. These boxes should be strongly built, with strong back access doors and locks (*see* Fig. 7). Where lettable offices are in various occupations, the postal authorities usually arrange to deliver letters (in office hours) to the various suites.

### Notice Boards

Ample wall-space must be provided in entrance halls for notice boards on which the names of the various firms or departments may be displayed. These boards should be in a well-lit prominent position near the main entrance and between the entrance doors and the lifts or staircase. The lettering should be confined within a space between 3ft. 6in. and 7ft. 6in. above the floor; if above or below these heights it becomes difficult to read unless the lettering is increased in size. In large blocks of lettable offices, notice boards with interchangeable letters are frequently used, allowing for changes to be made at minimum cost. Good clear lettering is essential.

### Kiosks

In many larger blocks of offices provision is made in the entrance hall for the sale of tobacco, chocolates, etc., from kiosks or stalls; the area required for this purpose is small, especially when storage space can be provided elsewhere—in a basement for instance. The total area provided is sometimes as little as 20sq. ft., although this does not permit much space for the comfort of the assistant in charge. These kiosks, when of the lock-up type, generally consist of a small counter with showcases on each side, access being obtained by hinging the counter. Where the layout of shops permits, shop windows or small sales-counters sometimes overlook the office entrance hall.

### Additional Lettable Space

In addition to office space in multiple-occupation buildings, there are a number of other possible sources of revenue, each dependent on a variety of circumstances. The demand for shops on ground floors—at least on a main street frontage—has already been discussed and the rental value is usually greatly in excess of that of offices, while costs (maintenance and outgoings) are smaller. When shops are either unsuitable or undesirable, there is possibility of providing certain lettable spaces, such as restaurants, suites for doctors or dentists, lettable conference rooms and even meeting halls, although the latter may complicate planning owing to regulations as to exits. Restaurants may often be placed in basement spaces which are unlettable for office or shop purposes.

Shops for barbers and tailors are often provided in office buildings which contain no other shops, since these trades do not necessarily require shop window accommodation and can be carried on in what are less valuable positions adapted to their needs. Consulting rooms for doctors and dentists are really suites of offices which are sometimes grouped round a common waiting room; the normal accommodation of a suite for these purposes consists of a waiting room, a consulting or working room, another room as private office or workshop and, if possible, a private lavatory.

There is often a demand for rooms which can be hired by the hour or day for conferences or smaller meetings. Where provided, they should seat at least 15 or 20 persons and are usually furnished in the manner of "board rooms," with large tables and comfortable table chairs. Sometimes a number of rooms are placed *en suite* and divided by folding partitions, in order that rooms to hold varying numbers may be provided; very great care and precaution should be taken to make these partitions sound-proof, since at meetings of this character, privacy and complete quiet are often essential; positions away from external noise should be selected.

If large meeting rooms are to be provided for such purposes as the holding of company meetings, they must be designed to comply with local regulations controlling public halls. For details of gangways, seating, galleries and general design, *see* "Assembly Halls" in the section on "Municipal Buildings."

### Board Rooms

For details of lay-out and sizes of furniture, *see* Part 1: Furniture.

### Office Corridors

Main circulation corridors should not be less than 5ft. wide, except in small buildings where corridors are short. When the width is only 5ft., or less, corridor cut-off doors, generally pairs of double swing-doors, become too narrow. Lighting corridors by windows direct to the outside air is not important and on congested sites it can seldom be managed; other means of lighting and more particularly ventilation must therefore be provided. Lighting can be arranged either by the

use of borrowed lights in doors and upper parts of partitions, or solely from artificial sources; ventilation may be by a mechanical plant, ducts from external walls to the corridors, or by fanlights or opening portions in partition walls. Offices placed on one side of corridors, although preferable, especially from the point of view of light and air, arc uneconomical, since the area of circulation is large in proportion to usable floor space. However, in country or semi-country districts, where site values are not so great, the feasibility of planning with rooms on one side of the corridor only, or at least with windows at the ends of corridors, should be considered. Since the minimum desirable height for corridors is usually less than for the adjoining rooms, false ceilings may be formed in which ducts, pipes and conduits of the various services are placed; this overcomes the difficulty of hiding otherwise unsightly casings or exposed pipes and ducts. When designing false ceilings for ducts the depth of cross beams must be borne in mind, as these may take up a large part of the space between the structural floor and the ceiling. However, if stanchions are placed on both sides of the corridor instead of on one side only, the connecting beams will be comparatively shallow.

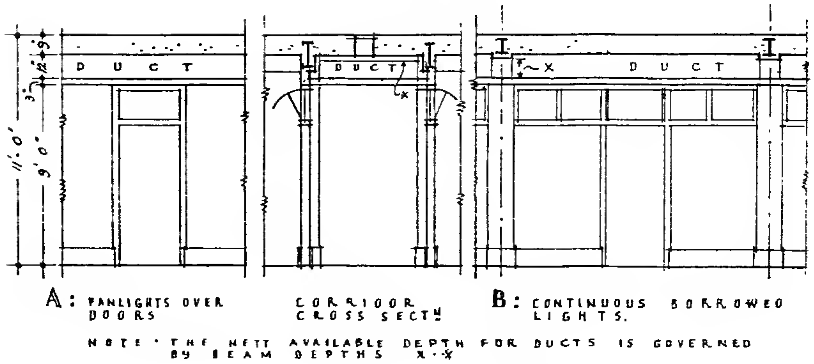



Fig. 8 Lighting central corridors

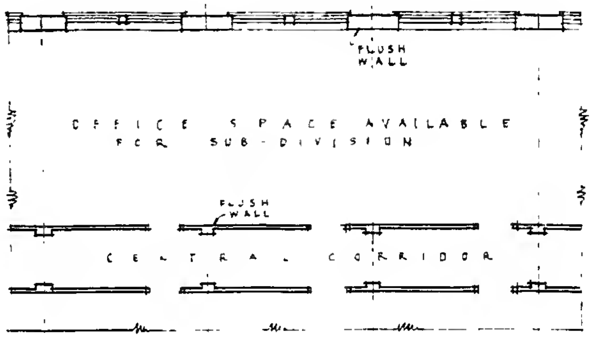



Fig. 9 Corridors

Fig. 8 illustrates false ceilings over corridors. Diagram A and the cross section show a space which may contain a duct for ventilation of the rooms if required and other services such as lighting and telephones. Fanlights over the doors provide ventilation to the corridor, but give very little light and constant artificial light is usually required. Access to the ducts, etc., for such services as telephones, gas and electricity, can be arranged in the floor of the corridor over. Diagram B of Fig. 8 shows a continuous borrowed light from the height of the door heads to the false ceiling. This provides more adequate lighting of the corridor and a fanlight or opening sash can be used over the door for ventilation, as in Diagram A.

As regards the questions of privacy and penetration of noise from rooms to corridors, fanlights do not appear to cause much trouble and there is no loss of privacy when borrowed lights are kept high. When glazed or partly glazed partitions are used between rooms and corridors, care must be taken in the selection of the glass. In rooms in which there is considerable noise, such as those used for typewriting, addressing machines or accounting machines, double-glazed partitions should be used. Fanlights and similar possible sources of noise from corridors should be avoided in such rooms as board and committee rooms, offices of important officials and the like.

When glazed screens are used as partitions between rooms and between rooms and corridors, keep the lowest level of glass at least 4ft. 6in. above the floor, so that a normal four-drawer filing-cabinet and similar pieces of furniture are hidden and do not show in silhouette against the glass. Glazed partitions of this half-height are specially valuable on lower floors where the lighting is not good and high-level borrowed light gives insufficient light in corridors.

**Partitions Between Rooms, etc.**

Fig. 9 shows how the partitions between corridors and rooms should be placed between stanchions, so that they provide a continuous flush surface on the room side. This is an important point for placing furniture in the rooms, or in the arrangement or re-arrangement of internal cross partitions. External walls may be made flush on the inside either by incorporating the stanchions in the wall thickness or by packing out on each side of the stanchions to form ducts for such services as heating pipes, telephone and electrical conduits. It is a great convenience to have these walls flush as there is little available wall space for furniture on this side of the room and if such space is broken up with piers its value is considerably reduced. It

should be noted that doors in the partitions shown on Fig. 9 are placed near stanchions; this generally permits better subdivision of rooms and, if the bay size permits, two doors to two separate small offices can be placed in one bay without difficulty. A central doorway, in an office one bay in width, breaks up the available wall space and makes arrangement of furniture more difficult. Also, when it is necessary to subdivide a bay into two rooms, the doorway would have to be moved.

Doors to all normal offices should not be less than 2ft. 8in. wide and preferably more, in order to allow easy handling of furniture in and out of the rooms.

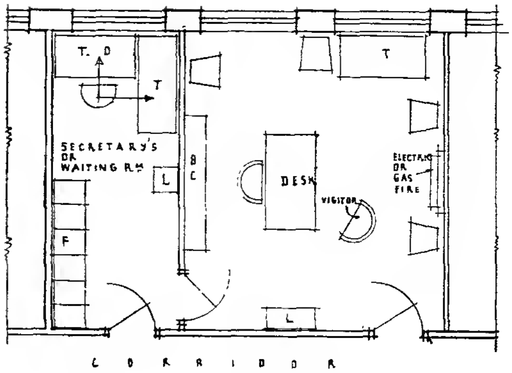



Fig. 10 Typical private suite

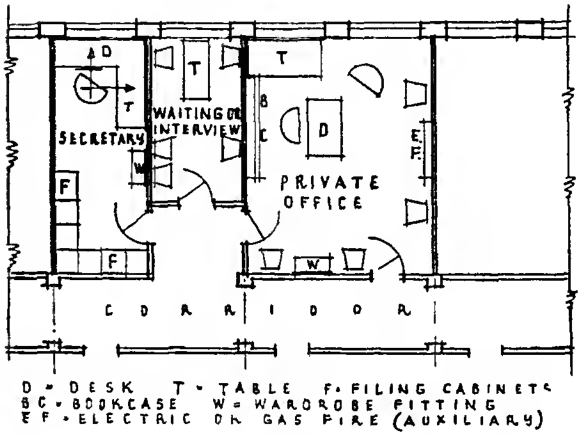



Fig. 11 Private suite

### Office Planning

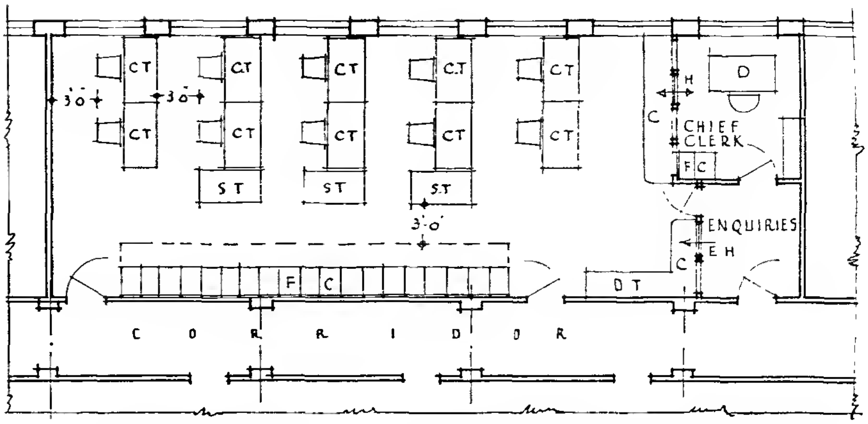
As suggested above, rooms to be used for private or general offices should, to ensure good daylight, be not more than 20ft. deep from the window wall, especially on lower floors of high buildings. This depth may be increased to a maximum of 25ft. on very open sites, or if the heads of the windows are exceptionally high above the floor level. It is recommended that working-rooms in offices should be designed to provide a sky factor of 1 per cent at 12ft. from the window wall on a working-surface 2ft. 9in. above floor level. Offices are sometimes given greater depth in order to provide space for tables on which papers or files may be stacked, or for filing cabinets or plan chests, which do not need the same amount of daylight. Offices requiring filing or storage space in conjunction with general or clerical offices are sometimes increased in depth by 4ft. to 8ft. to give the necessary floor area for the files and gangway space adjoining them.

### Private Offices

Fig. 10 illustrates a typical private office suite for an executive, such as a departmental manager; such offices require an area of about 250sq. ft. to 400sq. ft. Rooms for chairmen and managers are sometimes considerably larger, so that small conferences may be held without occupying committee or board rooms. Frequently, adjoining a chief official's room, a smaller room is planned, for use as a private secretary's office or waiting room. Rooms for secretaries may be as small as 80sq. ft. in area, although they are often as much as 200sq. ft. to allow space for storage of papers, filing, etc. Fig. 10 is shown based on a regular pier grid layout which has about 9ft. or 10ft. spacing from centre to centre. Two bays are allotted to the private room for the chief official and one bay to the smaller room for the secretary. Part of the secretary's room is sometimes cut off to form a small common entrance lobby to avoid direct access to the larger room; it is, of course, still necessary to provide a door opening directly into the corridor from the large room.

Provision has to be made in the offices of the more important officials for a writing-desk or table with desk chair, bookcase, side-table, wardrobe, three or four additional chairs, and often one or two easy chairs. Some form of heating to augment central heating is generally provided for use in limited periods in cold weather. The desk or writing-table (except under special requirements) should be so placed that it has left-hand light and so that the main entrance door to the room is in front of the desk and in full view of the person seated in the desk chair. Direct access between the principal room and the secretary's room saves time and walking, but care should be taken to make the door and partition soundproof against typewriter noise and the reverse transmission of confidential conversations.

The layout of furniture in an office, other than the main desk and its relation to the windows and door, does not




C T - CLERKS TABLE. S.T. - SORTING TABLE (FILING ETC)
F.C - FILING CABINETS. D - DESK DT - DISPATCH TABLE
C - COUNTER EH - ENQUIRY HATCH H - HATCH

Fig. 12 A general clerical office

call for special planning and is purely a matter of personal preferences on the part of the occupier. Fig. 11 illustrates a larger suite of rooms, comprising a principal office, a waiting room and secretary's room There are several advantages in this type of suite as compared with the suite shown in Fig. 10; for instance, the separation of the secretary and consequent reduction of noise and increase of privacy, the controlled entrance through the lobby and secondary way out of the main room. The lobby can be left open to the corridor, as shown on Fig. 11; this permits of better light and air and less monotony in the corridor width. The scheme is based on the use of four regular units of the grid layout, two for the main room and one each for the secondary rooms. A small but important point is to give the lobby sufficient depth, so that doors to the two rooms (secretary's and principal's) can be placed far enough from the partition between the rooms and the corridor to allow space for chairs and filing cabinets behind the doors.

The suggested table lay-out shown in both Figs. 10 and 11 for the secretary, provide for a typewriting table and an ordinary table to be within reach of a swivel chair, so that both types of table can be used without moving from the chair. Waiting or interview rooms need an area of from 80sq. ft. to 150sq. ft. being ample; it is seldom that more than two or three persons occupy the room at any time.

### Office Furniture

*See* Part 1: Furniture.

Fig. 12 illustrates a typical clerical or general office, with a separate office for the chief clerk and an enquiry hatch or counter. Desks are placed in single rows with left-hand light, and the remainder of the room is clear for filing cabinets, sorting tables and circulation space. Gangways should be at least 3ft. wide, clear of any obstructions such as open drawers. The distances between the front of a row of desks and the wall should be 4ft. 6in., and not less than 4ft. should be left between the back of one row and the front of the next row, unless there are more than three seats in a row, when the space should be increased. These sizes are, however, often reduced in many office layouts on congested sites where rentals enforce crowded conditions. The separate office for the chief clerk, who is likely to have more dealings with callers than any of the clerks in the general office, adjoins the public space. Such offices are frequently formed of glazed or partly glazed partitions, in wood or metal, extending to the ceiling. A hatch or door leading directly into the general office may be required. Enquiry counters are generally about 3ft. 6in. above the floor, and the public space cut off by the counter is sometimes divided by a partition fitted with a hatch. Space is usually needed adjoining enquiry counters for a seat or chairs for visitors or messengers.

### Rooms for Filing

In many offices entire rooms are devoted to files of documents, other than those in current or daily use. Filing rooms may have storage in several forms, such as filing cabinets, shelves for parcelled documents or books and for rolled papers such as drawings or maps. Racks are usually in the form of wood or steel shelving in units of about 3ft. or 3ft. 6in. lineal run; they should, if possible, be not more than 7ft. or 7ft. 6in. high, although conditions may necessitate using the full height of the room. The shelving, to accommodate foolscap size files, should have an overall width of 15in. back to front. Space for circulation between shelving units should not be less than 2ft. 6in. and, between filing drawer units not less than 3ft. 6in.

Filing rooms often have artificial light, but if clerks work in the rooms reasonably good daylight is essential. Other important factors are good ventilation and dryness without excessive heat.

### Drawing Offices

Such rooms should have north or north-east light and, where possible, top north light in addition. There should be a sky factor of at least 5 per cent on working-surfaces, normally 3ft. above floor level. Fig. 13 illustrates two typical layouts. Both examples show drawing-tables placed adjoining the window wall, but in Type A, the draughtsmen face the window, whereas in Type B the light is thrown across the board from the left side. Draughtsmen generally appear to favour the position shown in Type A, but sometimes the criticism is offered that strong light is reflected into the eyes by the paper on the drawing-boards. Type B is obviously more suitable for vertical drawing-boards if these are preferred to tables. Benches on which drawing-boards are to be placed should normally allow for antiquarian-size boards, and be 6ft. 6in. to 7ft. long per person and 3ft. 6in. to 4ft. wide. If

drawing-tables or pedestal boards, which may be set at any angle, are used with T-squares attached, slightly less space may be found adequate, though a small table or chest of drawers is then often required and the whole occupies at least as much space as drawing-boards on benches. It should be noted that the plan in Type A shows one more drawing-table than Type B, with more circulation space. To obtain the same number of plan chests in Type B it is necessary to place some under the detailing tables, which can be inconvenient. An antiquarian-size plan chest requires a space about 5ft. by 3ft., and double-elephant-size about 4ft. by 2ft. 8in. Vertical drawing files vary considerably in size, but may save considerable floor area if standard in layout.

Chief draughtsmen are often provided with a separate office at one end of a general drawing office, by means of glazed partitions. A similar arrangement to that shown in Fig. 12 works well, as enquiries and travellers may be dealt with at an enquiry counter or hatch and the proximity of the chief draughtsman's office eliminates the necessity for callers entering the main drawing office.

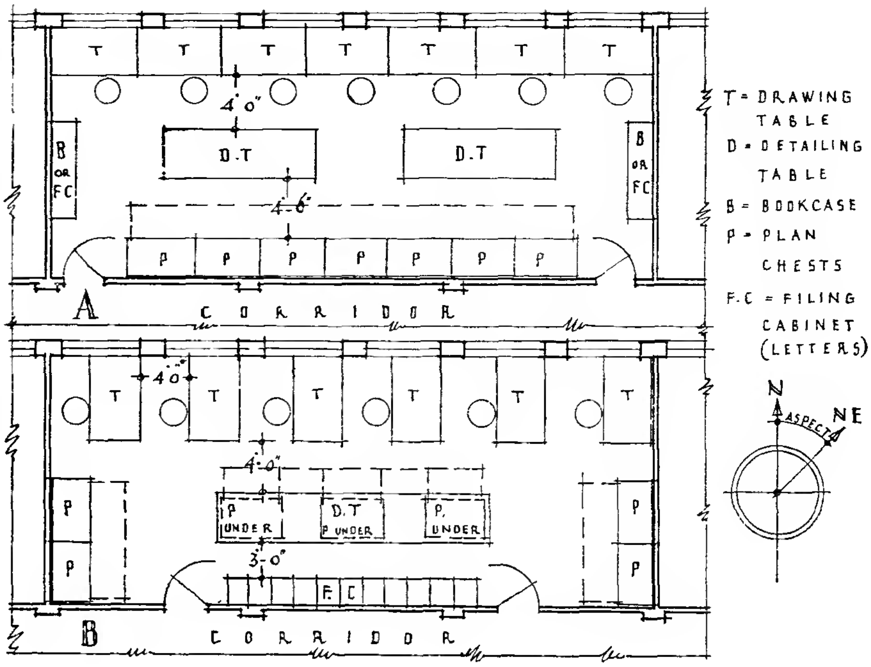



Fig. 13 Drawing offices

### Lavatories

No specific requirements, but *see* Part 1: Sanitation and page 302.

### Floor Loads

For normal offices a superimposed floor loading of 50lb/sq. ft. should be assumed for all floors above the ground floor, while entrance floors and basements should be designed for 80lb/sq. ft. Storage rooms such as stationery stores and bulk-filing rooms, however, need different treatment and a loading of at least 100lb/sq. ft. should be assumed.

### Equipment

In the general equipment and services of office buildings, planning consideration must as a rule be given to the following—heating, hot and cold water, lighting, power points for machines, auxiliary heating, telephones, cleaning and disposal of waste. In addition, other services sometimes required are letter chutes, communication tubes and vacuum cleaning.

### Lighting

Electric lighting is usual in all offices to-day. In lettable offices the lighting of all circulation spaces (entrances, staircases and corridors) and communally used floor spaces, such as lavatories, is generally provided by the landlords, and the tenants pay for that used in their own offices. Since the individual requirements of each tenant are unknown, it is usual to provide ceiling outlets at regular spacing in the bays and, in addition, skirting points round the walls, but junction boxes and leads with a large margin for increased loads should be placed at intervals in all corridors and in floors from which extra points may be wired. In large buildings, considerable space may be necessary for main distribution; meters and fuse boards are generally placed in the basement, with ducts and chases leading to all floors for local distribution throughout the building. Meters for each tenant are provided within his own floor space or in recessed boxes or cupboards in corridors. The important planning factor is to provide ample space for distribution in central positions, so that alterations to suit each tenant may be made with the minimum of disturbance.

The amount of illumination recommended in "The Lighting of Office Buildings" (M. of W., 1952, H.M.S.O.) is as follows:

- General offices, 20 lumens per sq. ft.
- Drawing offices, 30 to 50 lumens per sq. ft.
- Private offices, 15 lumens per sq. ft.
- Entrance Halls, etc., 6 lumens per sq. ft.

### Telephones

Telephones come under two groups; first, Post Office or external telephones and secondly, internal telephones, which may either form part of the external system or be separate. The positions in which telephones will be needed are largely unknown in lettable buildings and even in other office buildings, until the furniture plans have been decided. The main cable usually enters the building below pavement level and if the building is a large lettable block a distribution frame or case is needed in a dry, well ventilated, non-public space; from the distribution frame it is useful to have a main vertical chase from which leads may be taken as required from junction boxes at each floor level. Opinions vary considerably

as to the most suitable method of distribution on various floors, some authorities advocating runs of conduit with access boxes spaced regularly through the building, while others suggest corridor junction boxes from which any telephones may be used. Telephones appear to be most used fairly near window walls, while skirting outlets seem the most practicable.

### Fire Protection

Apart from the general requirements already mentioned, office buildings, both lettable and in single occupancy, are often supplied with fire-fighting equipment.

Sometimes sprinkler installations are provided in shops or large general offices. It should be remembered that sprinkler outlets are visible and therefore require to be laid out on the ceiling plans in an orderly manner. Certain parts of sprinkler equipment occupy a considerable space; for example, main control valves, stop valves, and some mains may be as much as 4in. or 6in. diameter. Stop valves should be in an accessible position near the main entrance, with close connection to the sprinkler alarm-bell and to a notice outside the building giving the location of the valve. A sump is required for emptying the system and for periodic tests. If any portion of an office building is let to tenants requiring or producing high temperatures in rooms where sprinklers are installed, the fusible portion of the outlets must be changed to suit such temperatures.

Where water pressures of mains are low (or for certain other reasons in some districts), buildings are equipped with " dry mains "; these are adequate-sized vertical mains having connections for fire-engine equipment at pavement levels. Through them water may be pumped to hose outlets on the various floor levels, from which firemen may operate. Such a system may eliminate the use of canvas fire hose inside a building with reduction of the possibility of damage by water. Local hose-reels or cabinets with hoses and nozzles can also be used. The former are best if hinged to walls and arranged to fold back into special recesses; the latter should be of hardwood or metal, also recessed, with glass fronts. The position of such internal local equipment, as also of chemical fire-extinguishers, should always be planned to be easily visible in corridors or on staircase landings (but not on the staircase side of fire doors or to staircases) and at the same time so arranged as to have the minimum projection into circulation spaces. Such local equipment should be placed as nearly as possible in similar positions on all floors. Fire-alarm bells are automatically operated by sprinkler systems, but where hand-operated push-button bells are installed, these too should be in similar positions on all floors, if possible near the local fire-fighting equipment. The bells should be arranged to ring simultaneously on all floors—in the main boiler room, engineer's office and in the central telephone exchange room, if these exist in the building.

### Cleaners' Stores

A cleaners' store should be provided on every floor of any large office block, the size depending largely on the number of offices on any given floor. The fittings should consist of a sink, with hot and cold water, draining-board, racks for brooms and polishers and a cupboard for smaller articles. Room should be provided for waste-paper bins (*see* below).

The store should, if possible, be ventilated to the external air; often such stores may be planned in conjunction with the lavatories on each floor of the building.

### Waste Paper, etc.

The collection of waste paper from various office rooms is usually made by the cleaners at the end of each day; it is placed in the cleaners' store-bins mentioned above and then collected (usually early in the morning, when general cleaning of stairs, corridors, etc., takes place) in a central storage room, usually in the basement, where it is sorted and arranged in suitable bins or bagged in readiness for collection.

### Canteens

In larger offices it is becoming general to provide a canteen for the staff. The lay-out and planning should follow the recommendations made in the sections on Factories, Schools and Hotels.

In some large office buildings separate rooms have to be provided for varying grades of staff such as directors, management and general staff; these several rooms should be served from the same kitchen which should be so placed that easy access is provided to all rooms, but those designed to serve the greatest numbers should be given the most direct relationship.

Where canteens are not provided facilities for making tea are almost always needed and consequently provision has to be made for suitable water supply in lavatories or cleaners' stores, and means of heating it must be provided. In small offices, gas rings or electric kettles are sometimes provided in typists' offices, but in large offices central tea-kitchens are often installed with proper facilities, such as urns, a sink, china cupboards and trolley space; such a scheme is applicable only to large buildings where there is no canteen (if in one occupation) or where the size of building, and the number of tenants and their staff justify the employment of someone to make, distribute and/or sell refreshments.

### Housekeeper

It is fairly usual to provide a flat for a resident housekeeper in large office buildings, but even if this is not required, a small office near the entrance is usually needed.

## Introduction

Buildings for this purpose have four main divisions, namely, receiving, storing, selling and dispatching goods; to which must be added rooms for administration and for comfort of buyers and staff. Methods of selling influence planning considerably, as they vary from the " cash and carry " on the one hand to exclusive shops dealing in one type of article only on the other; they also include the department store.

In all classes the following main factors must be considered: display and general attractiveness to purchasers, ease of sales transaction, flexibility or re-arrangement of floor space in the building and minimum cost of construction, maintenance and operation of the building.

Shops and similar buildings may be classified under the following main headings:—

(1) Departmental stores.
(2) Large shops dealing mainly in one trade.
(3) Small shops dealing mainly in one trade.
(4) Surburban, small town and village shops, also mainly dealing in one or two trades.

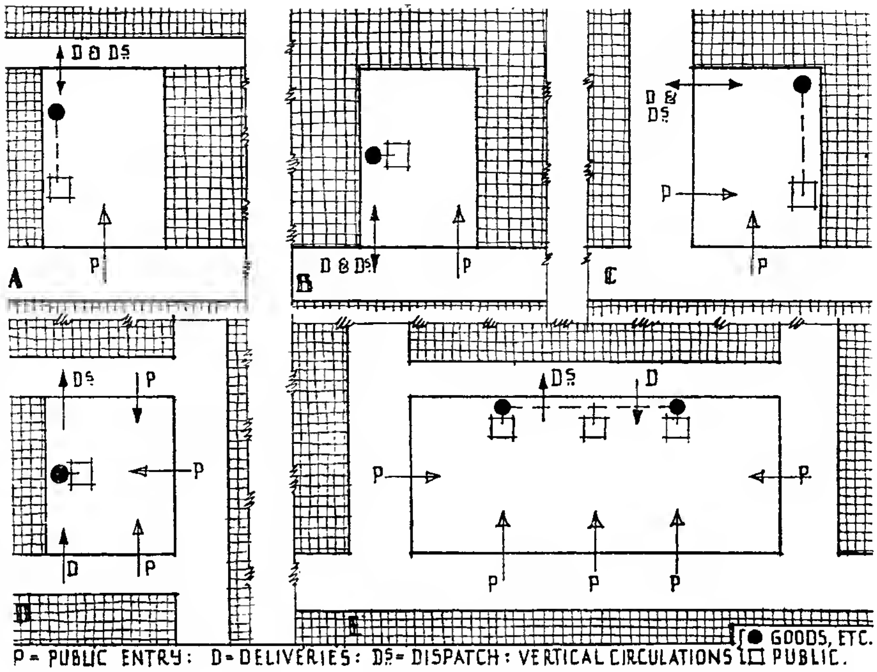



Fig. 1 Typical site considerations

These classifications are necessarily broad, as each type includes buildings of vastly different character, organization and plan. For example, in class one must be included buildings such as Harrods and Woolworths.

## Sites

Generally in every city and town there are defined districts in which all shops are situated. Certain general factors arise in every shopping area. The " right " side of the street, stopping-places for public transport vehicles, the size and shape of the site and its relation to the surrounding streets all affect choice of site. The sides of streets which are sunny during late morning and afternoon generally provide preferred sites; in hot climates the reverse is naturally the case. Shops of a similar nature and quality in the same neighbourhood are not always a disadvantage. Corner sites have some advantages, except under congested traffic conditions. Such sites have more external wall for display and light, easy access from two streets and dual approach to the display windows.

In the case of large shops and stores, frontages on at least two streets are practically essential. Even for small shops in the suburbs or small towns, it is a great disadvantage and inconvenience to general traffic and to customers to have delivery or dispatch vans using a main entrance.

Under town planning legislation local authorities may now require special " draw-in " facilities for the taking-up and setting-down of passengers and for the delivery and dispatch of goods; such facilities being within the area of the site of the building.

Fig. 1 shows typical shop sites in relation to surrounding streets and the disposition of access and circulation for public and goods. Type A has public access from a main street only with a minor street available for goods access. Type B has access for all purposes from one street only; therefore, the public and goods entrances are separated as far as possible, but vertical circulations may be grouped to economize floor space.

Type C is a normal corner site, with public access from two streets. Here the public vertical circulation should be related to the two entrances and not divide the selling space unduly. Type D shows a corner site having frontages to three streets, two of which are of less importance than the third. Public entrances are concentrated near the main frontage; delivery and dispatch of goods are from each minor street at the rear of the site, with vertical circulation for goods in the centre of the site, behind the public circulation. The latter is placed equidistant from all entrances, but placed so that customers pass through the shop and its display counters to reach the lifts or staircases. Type E is a long island site having a minor street in the rear from which deliveries and dispatch are made and the public enter from three sides. Vertical circulations are divided for the public and goods are divided into arrival and dispatch. Shop sites in new developments where open sites are available, as in new suburbs or towns, will be considered later in this section.

Fig. 2 illustrates in diagrammatic form the essential circulations of goods, staff and public in larger shops and stores.

### Departmental Stores

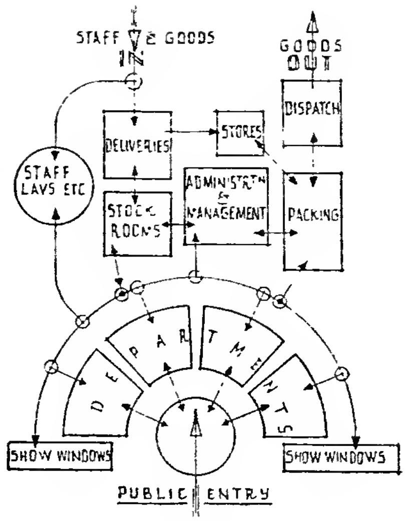
This type of shop has to deal with vast numbers of customers in very many departments, each of which is separate in regard to some matters, such as buying of goods, but shares services such as deliveries, dispatch and administrative offices. There appears to have been, in recent years, a tendency to make each department a separate shop within a shop, even to the extent in one or two cases of having separate main entrances to certain sections. The main planning considerations are circulation of customers and housing and display of goods and may be divided under the following headings:—

(1) The relative positions of the entrances and exits, both main and subsidiary, for public, staff and goods, and their relation to the streets.
(2) The position of the vertical circulations, lifts, staircases and escalators in relation to the entrances and selling space.
(3) The possible height of the building.
(4) The stanchion layout for efficiency of construction and arrangement of fittings.
(5) Position of administration, a chief factor in which is the amount of cash sales and whether a centralized cash department, or counter cash receipt system is adopted.
(6) In the case of large sites consideration of arcade planning or recessed show-window areas.

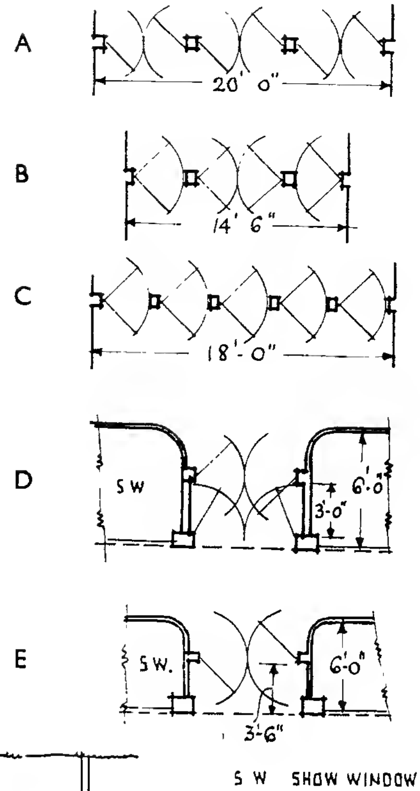
To these principal factors must be added such matters as rights of light, basement depths affecting underpinning of adjoining property and any special departments such as restaurants.

### Entrances

To ensure proper and complete control and to avoid wasting frontage useful for window display, entrances should not be too numerous. An American authority suggests that there should not be more than one entrance for each 80ft. to 100ft. of frontage, but this is, to a great extent, dependent upon the number of exits and escape staircases required by the local authority. In ordinary circumstances entrances should not be placed on corners, as

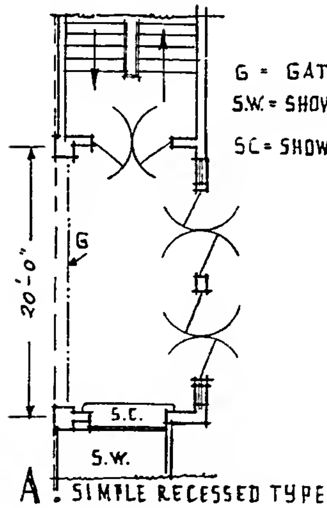


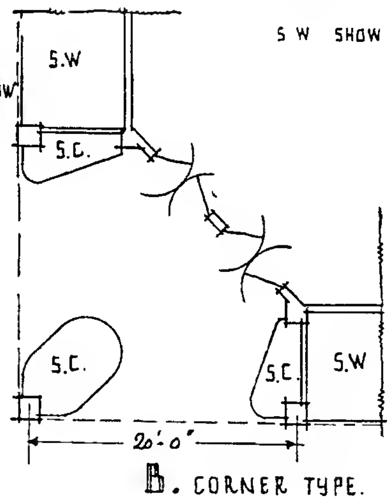

Above: **Fig. 2** Analysis of circulation

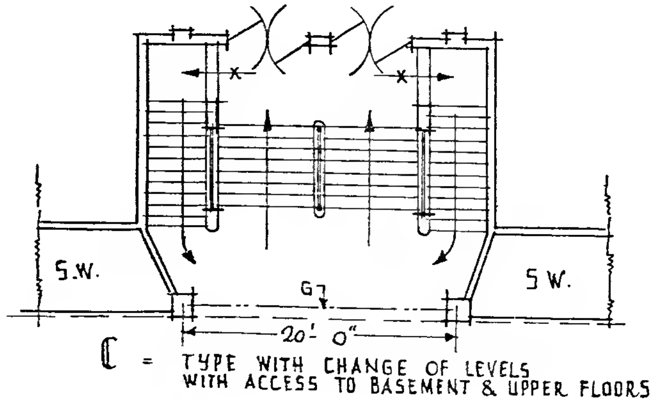



Right: **Fig. 3** Typical external door arrangement and spacing

Below: **Fig. 4** Typical entrances



these are too valuable for displays, which may then be seen from far away; also doors on corners deliver customers into the most crowded parts of streets.

Entrance doors may be arranged in various ways, as illustrated in Figs. 3 and 4. Two doors at each entrance should be provided in all large shops or stores, each swinging both ways, to allow persons to enter and leave at the same time.

Doors may be hung either in pairs, as in Fig. 3 A, or singly, as in Fig. 3 C, or in a combination of the two, as in Fig. 3 B. The single type has the advantage over the double type in avoiding confusion, as there is one door for each person entering or leaving.

Figs. 3 D and 3 E show two typical arrangements of a pair of entrance doors; in D external doors are shown, which, if they are to open inwards, must be fixed open during business hours; E gives a single pair of doors which have to be set back from the face of the building to prevent the outward swing from obstructing the pavement. In each example it is desirable to make the depth of the display windows or showcases sufficient to prevent doors swinging into internal circulation space.

Entrance doors should be set back from the frontage to form a lobby or pause space between pavement traffic and the shop itself. Entrances should be without steps; any changes in level required by falls of the pavement on a long frontage being dealt with on the ground-floor level inside the building. Fig. 4 illustrates three typical entrances; Type A shows a normal direct entrance, combined with a staircase which may serve both basement and upper floors, but the lifts cannot be reached except by access to the ground floor and therefore the staircase is normally useful for escape purposes only.

Type B shows a good corner entrance, if in any circumstances this position has to be adopted. It permits easy access to both streets without using the actual corner and therefore provides a lobby space which is otherwise difficult to plan.

Type C shows a combination of an entrance to the ground floor and direct access to the basement and/or the upper floors. All entrances should be capable of being closed at night on approximately the frontage line either by means of folding gates or by means of doors.

**Column Spacing**

Structural column spacing is a vital point of planning. It must be designed to meet the typical layout of selling floors. Owners of stores like columns to be reduced to the minimum number; it has been found that a spacing of 21ft. to 22ft. centre to centre allows the most satisfactory layout of counters and showcases for general purposes, although sometimes in some shops spans of 25ft. have been adopted. Beam depth must not reduce headroom unduly as overall building heights are usually limited by local building acts or by-laws in each area.

**Floor Areas**

In most other countries and in some cities in this country (other than London) there are no restrictions as to cubic contents or area of clear floorspace. In many areas, however, it is impossible to adopt a complete open plan owing to the restriction that buildings should be divided into cells not exceeding 250,000cu. ft. each, to avoid rapid spread of fire.

These compartments may be arranged horizontally as one floor over another or in units side by side, separated by fire-resisting division walls or partitions, connected only by self-closing fire-doors, or by enclosed lift shafts or staircases. This restriction makes escalators difficult and prohibits those monumental staircases running through all floors, which are used abroad with great display value. The cubic content limit also makes planning with open wells between floors difficult to arrange through more than two floors.

It has usually been found most economical to place fire-resisting divisions vertically and use automatic self-closing steel shutters or doors. Vertical divisions also permit of the use of open lifts and staircases from which various floors may be seen. Sometimes this 250,000cu. ft. may be exceeded when exceptional precautions are taken to reduce fire and escape risks. The regulations are more lenient in some districts, but in all cases insurance companies have considerable influence if premiums are to be kept low.

Openings in division walls separating units of 250,000cu. ft. require floor jamb and head to be of fire-resisting materials and to be closed by metal doors or shutters of specified thicknesses fitted in grooved or rebated metal frames. The openings are not to exceed 7ft. in width and 8ft. in height. The openings taken together must not exceed one-half of the length of the wall. Division walls are generally based on party-wall thicknesses or any special construction and thicknesses to which special assent may be given by the authorities concerned. Division floors must be of approved fire-resisting construction with all vertical communication between floors cut off.

**Vertical Communications**

The placing of main vertical communications, such as staircases and lifts, is of utmost importance in the early stages of all schemes for store buildings. Generally, the main staircases and lifts should be grouped together immediately opposite the main entrance, in order to circulate customers past the maximum amount of display area, particularly for special or "bargain" goods, often allocated to ground floors. Lifts placed near the entrances, although permitting customers to reach and leave the upper floors more quickly, tend to cause congestion near the main doors and waste valuable selling space.

Vertical communications are closely connected with means of escape in case of fire and, at least so far as staircases are concerned, all types act for both service and escape. Means of escape, seldom laid down by local authorities but which must be to their satisfaction, depend on the following: the area and disposition of the building, the number of persons for whom escape must be provided, the construction of the building and the provision of fire-alarm systems, sprinklers and other appliances.

In general there should be at least one enclosed and protected staircase and exit and, in addition, an alternative means of escape such as another enclosed and protected staircase and exit, a suitable staircase in another block to which access may be obtained by door openings in party or division walls, or by external means such as external balconies to adjoining buildings, or external staircases. Alternative means of escape on each floor should be as far apart as is practicable.

Fig. 5 shows two half-plans of store buildings with alternative positions for

vertical communications. Example A places the main staircase and lifts in the centre of the plan but near to the front street, and it will be seen that the entrance is cramped and customers tend to go to upper floors without entering the ground floor, also the lifts are somewhat difficult to find on entering, except from the side street. In Example B the lifts are directly opposite the main entrance, in full view of customers entering the store, and necessitate circulation of the store past display counters. In Example B the main staircase is made of less importance and is duplicated on each side of the battery of lifts, which involves, in a plan of the same area as Example A, an additional staircase. In both examples the lifts are grouped together, but in A the space is cramped, although the whole group may be cut off for fire purposes by two fire doors on each floor, instead of one to each lift as needed in B. The arrangement in Example B is convenient for planning of goods lifts behind the passenger lifts, and also cuts off satisfactorily a portion of the floor area for service purposes such as stock, staff, and packing rooms.

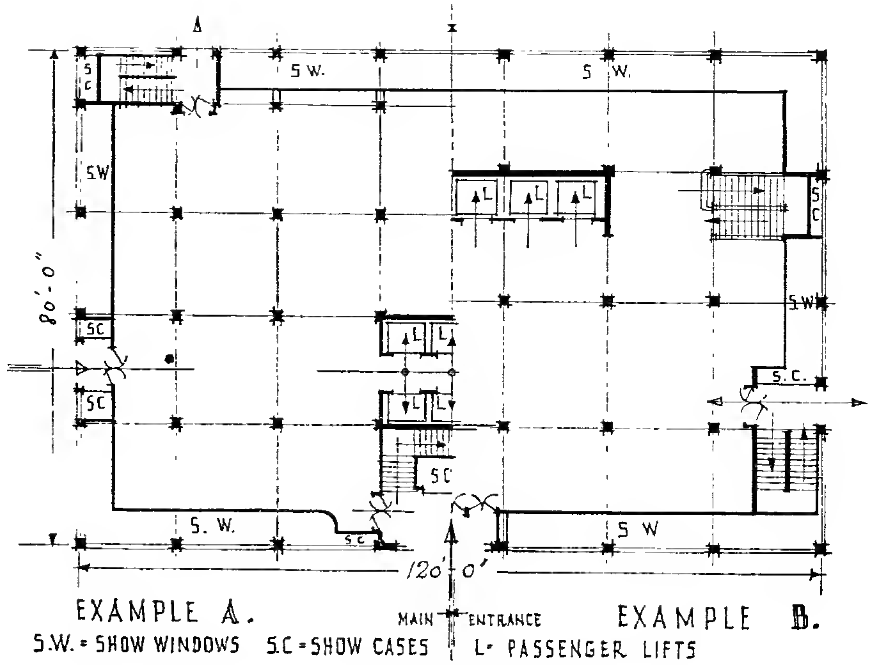



Fig. 5 Vertical communications

### Staircases and Escalators

*See* Part 1: Circulation.

### Lifts

Lifts for customers should always be grouped together, and not scattered over the floor area, in order to provide alternative accommodation and avoid waiting. Adequate circulation space is important in front of lifts at all levels. *See* Part 1: Circulation.

### Floor Heights

Floor heights are largely governed by total building height limits set by local authorities. Selling floors should have a height of at least 12ft., but more than 14ft. is generally unnecessary. Ground floors are frequently made higher than other floors in order to provide light and ventilation over shop windows. Floors not used for selling but for administrative purposes should have a clear height of 10ft. 6in. Several basements are often installed; the use of more than one basement is usually due to the desire to obtain the maximum amount of floor space in a building of limited height, the lower basements being used for stockrooms, staff cloakrooms, sorting, dispatch and engineering-plant rooms.

### Daylight to Selling Floors

The amount of daylight required for selling floors of shops and stores is a controversial subject; undoubtedly large window areas save some cost of artificial illumination but many shopkeepers prefer to sell by artificial light or desire to place fittings or small rooms such as fitting-rooms along the external edges of selling space; this placing of fitting-rooms has the advantage that customers may use natural light. Ground floors, by reason of the display windows on the façades requiring solid background, seldom have more than a small area of window or ventilation above display fittings.

### Floor Loading

For normal display and selling areas the minimum superimposed floor load should be taken as 80lb/sq. ft. This loading is also adequate for most work-room purposes. It must, however, be noted that storage or even display of some products may involve heavier loading and is likely to vary in different parts of a store building. It may be advisable to calculate for heavier loads throughout to guard against future departmental changes. A good average load is about 1cwt. per sq. ft., but this is often increased to 2cwt. where linoleum, carpets, or stacks of fabrics are stored.

### Distribution of Departments

There are few special positions for the various departments of a store and different layouts may often be found even in adjoining stores. It has been customary to place the " bargain " departments in the basement, food sales

on the ground floor or basement because of the rapid handling of goods that is required, women's clothes and millinery on the first floor, together with lady customers' toilet, rest and writing rooms, although these are frequently attached to the restaurant, which, if provided, is generally placed with its kitchen on the top floor; men's departments should be readily accessible from the street. It is general to place departments having the greatest activity on the lower floors, so that the volume of traffic decreases as it rises.

### Circulation of Goods

Having considered the circulations for customers, it is now necessary to turn to the circulations for goods, staff and administration, bearing in mind that the only normal contact of the two sections is at selling counters. The main circulation for goods is as follows: Receiving and stockrooms, from which goods pass to the selling departments, and finally are packed and dispatched. The receiving and dispatch of goods should, if possible, be entirely separate, to avoid confusion and delay. Goods are delivered either by lorry directly from the manufacturer, or by shipping and railway companies, messenger or post. On arrival, goods must be checked, unpacked, sorted, marked and sent either to stockrooms or direct to sales counters; the receiving department must have, therefore, adequate working space for these purposes, together with offices, the actual size being dependent on the size of the store and the type of goods it sells.

In congested areas in some American cities where there are main streets on all frontages, loaded lorries are placed on lifts and taken bodily to the main stockrooms, which are combined with receiving rooms; such procedure is generally unnecessary in this country, as an unimportant street or site facilities are usually available in which unloading docks may be arranged without interrupting the street traffic. Lorries vary in length from about 18ft. to 33ft. overall and are up to 7ft. 6in. in width. The minimum length of an average lorry stand should be 21ft.

Fig. 6 illustrates minimum dimensions required for a dock to hold two vehicles at one time, which is generally the minimum number for which it is wise to make provision. The entrances are generally closed by rolling shutters at night. The dock itself should be about 3ft. 6in. above the roadway level and the levels of the dock and the store floor should coincide. Adequate space is essential between lifts and the edge of the dock for handling and unpacking goods and container trucks, at least 10ft. being desirable.

The main goods lifts must be carefully related to receiving docks to avoid excessive handling and are best placed as shown in Fig. 6. The greater dimension of the car should be the width rather than the depth. The lifts connecting the floors and the receiving department need to be large, as not only large goods such as settees and pianos have to be carried, but also large fittings for use in the shop itself. These lifts should be at least 8ft. wide, 6ft. deep and 10ft. high.

### Stockrooms

Lifts from the receiving rooms take goods either directly to selling floors or to main stockrooms, which may be either in the basement or on an upper floor. The basement or sub-basement is the most general position for stockrooms, although sometimes it is argued that top floors are more satisfactory for distribution to selling floors and also that basement space, being nearer the street, is more valuable for selling space.

Stockroom equipment consists mainly of metal bins and adjustable shelving divided into compartments by metal mesh partitions. Gangways must be at least 3ft. wide to permit easy movement of trolleys. To ensure easy readjustment of storage space the equipment should be standardized as much as possible. Good lighting is important, though daylight is not specially needed and the rooms should be dry and well ventilated.

Departmental stockrooms are often placed adjoining each selling space, but concealed from it. Adequate vertical connection between the stockrooms and the floors must be provided either by service lifts, dumb waiters, or chutes, the latter only being possible if stockrooms are on top floors.

After sale, goods must be wrapped for removal by customers or for delivery. In the first case it is essential that wrapping is done near the selling counter in the minimum of time. For delivery separate packing rooms on each floor are often provided, or goods travel to a packing room near the dispatch department. In both cases gravity chutes are often used to connect various floors to the delivery sorting room for the transport of small parcels or of standardized containers in which the parcels are placed. The sorting room is usually situated in close proximity to the dispatch docks; its equipment generally consists of a large revolving table on to which the chutes deliver the packages and from this table the goods are picked off, registered on the van delivery sheets and put into baskets or trolleys which are assembled in the dispatch room for transport to the vans, or passed to a posting department.

Dispatch is by means of loading docks, where vans for each district collect goods; in congested districts, where vans cannot wait satisfactorily, the goods are taken in bulk to another building in a less congested area for delivery by ordinary vans. All rooms in the dispatch section vary in size according to the type of business and organization of each store.

Special precautions against fire should be taken in packing rooms where quantities of inflammable materials such as paper and wood-wool are used. Fire is apt to spread up chutes and these should have adequate fire doors (gravity-acting with fusible links) provided at suitable points.

### Cash

The method of handling cash also affects planning. Systems may be divided roughly into two types: cash registers in each section or pneumatic tubes or other conveyance to centralized cash stations. The latter system has the disadvantage of being slower in operation, but if adopted, a cash department is needed in a central position in the building, but nearer to floors having most transactions, usually the ground floor. Tubes may be placed in floors or ceilings, are generally about 2¼in. in diameter and require a space of about 4in. in addition to structural necessities. Pneumatic tubes or document conveyors are also installed for communication between departments, sending of orders, invoices and general management; considerable time is saved over that occupied by messengers carrying the papers.

### Selling Counters

Planning space for selling varies considerably in each department; no hard-and-fast rules can be given for layouts, except where there are a number of departments selling various smaller articles (almost always placed on ground floors and in basements). These can be dealt with in multiple unit fittings, designed mainly as islands, as shown in Fig. 7, in conjunction with the typical column spacing of the shop. These fittings generally consist either of a central fitting about 6ft. 6in. high surrounded by counters which form showcases about 3ft. 3in. high above the floor, or, more simply, two counters with a serving space between. Aisle widths should not be less than 8ft. when there are serving counters on both sides, but may be reduced to about 5ft. 6in. when counters are on one side only.

The width of aisles is dependent on the space required for serving, and at least 20in. should be allowed for customers standing at counters; it is generally wise to round all corners at intersections.

Island showcases should not be placed in main aisles unless the latter are wider than 10ft., and there should be no "bargain" tables in aisles less than 12ft. wide.

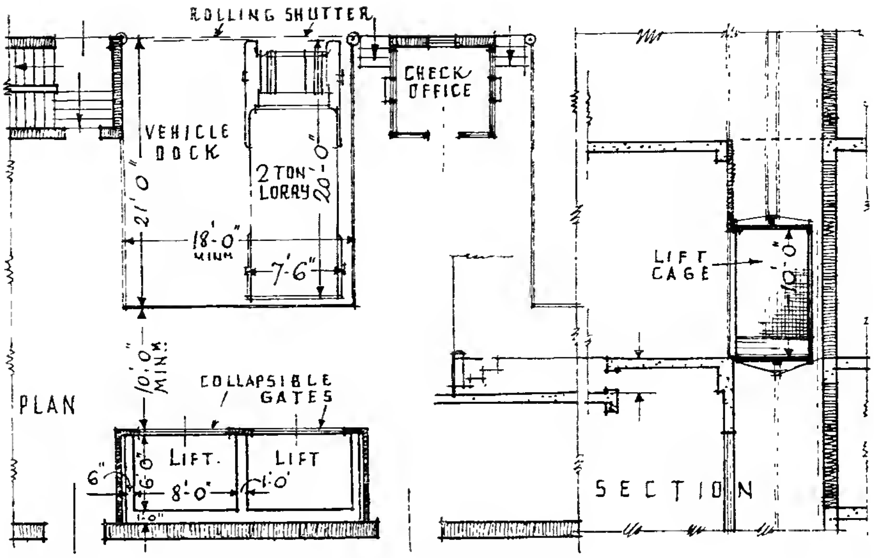
Tall stock or back fixtures vary in depth from about 18in. to 33in., with a preference for narrower widths, even if rolls of material have to be placed sideways. In these back fittings may be placed cash registers, tube stations for cash or messages, wrapping-tables, etc.

Counters are generally about 3ft. 3in. high, and variations depend on whether customers are likely to sit or stand when making purchases. The space between the back fitting and the counter must be at least 2ft. and preferably more and care must be taken in detailing drawers, trays and cupboard doors, so that all fittings may open easily into this space. Counters vary in width from 18in. to 30in., but about 24in. is most general. The actual design of the fittings to receive the various types of goods has, to a large extent, been standardized in practice by the many firms of shopfitters and as the details for each trade vary so much, the information is beyond the scope of this book. Often the floor of the space between the counters and the back fittings is raised about 4in. in order to raise the salesman a little above the customer and also to provide a more comfortable floor material on which to stand for long periods than that generally used for the floor of the public space. Wall fittings are used either to divide departments or are placed on the perimeters of selling spaces; they are generally about 6ft. 6in. or 7ft. high, with showcases 2ft. to 6ft. high above, bringing the total height up to a maximum of 12ft. It has been found that 6ft. is about the highest for use without steps.

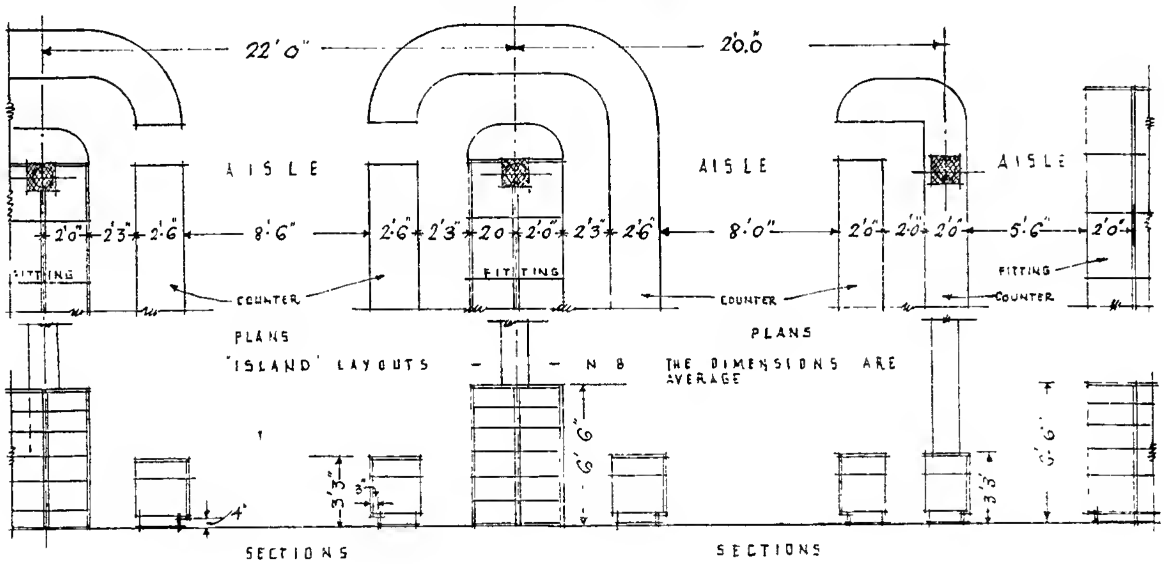
Fig. 8 shows three typical sections of wall fittings. Type A is for use behind counters and is fitted up similarly to back fixtures used in island counters. Type B is for use without a counter, but a draw-out flap or shelf is provided. Type C is a wall fitting for use without counters and is mainly for display purposes. These fittings are not generally taken to the full height of the shop because they would not then be protected by a sprinkler system; it is generally convenient to have ventilation outlet grilles above the fittings; it is also troublesome to fit fixtures between ceiling beams.

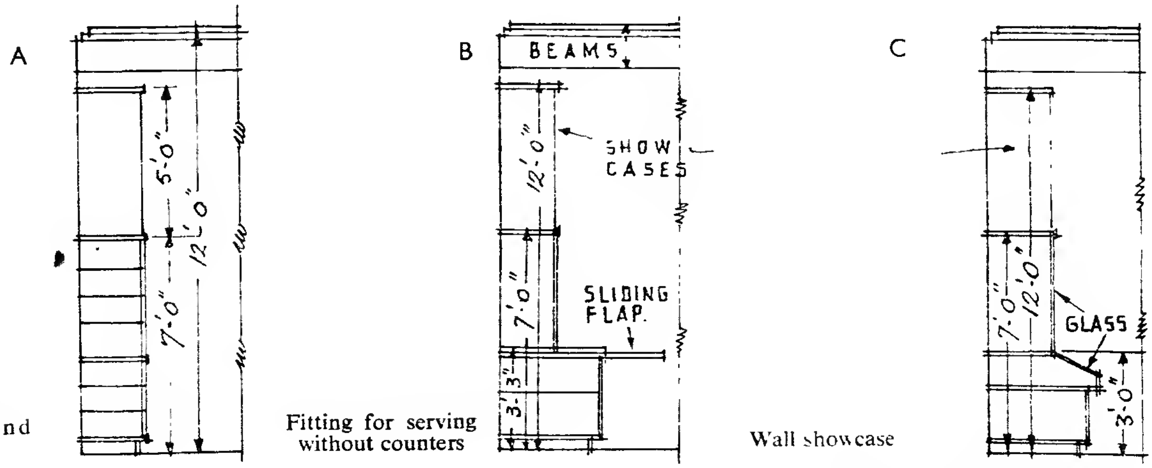
The layout of upper floors and of departments where multiple unit fittings do not apply is generally fixed by apportioning a number of bays of column spacing to each trade, and separating them either by aisles or tall fixtures. The fittings are generally special for each department, some of which display only a very small amount of stock, as in the case of ladies' clothes, where most of the stock is placed in stockrooms adjoining the main selling spaces. The latter can then be arranged with tables and easy-chairs to give a more comfortable impression than can be provided in rooms surrounded by counters. On some upper floors the floor space itself is often used for selling and the aisles are generally wider.

Fig. 6 Typical sizes for loading docks




Below: Fig. 7 Serving fittings, etc.




Fitting behind counters

Fitting for serving without counters

Wall showcase

Fig. 8 Wall fittings (showcases)

### Self-Service Shops

There is an increasing demand for self-service methods in retail shops, especially those dealing with food. Self-service does not affect seriously the general broad planning of the building except in regard to control of entrances and exits and location of stock storage, but it influences considerably the layout and types of display, service fittings and counters.

The shop layout should achieve large display-spaces through which customers circulate easily from the entrance to a controlled point of exit.

Only limited window-display is needed, and it is better to provide as clear a view as possible of the whole interior as this is in itself an attraction from outside. It is also advantageous to plan spaces for perambulators and cycles to be left, either outside the shop or immediately inside the entrance.

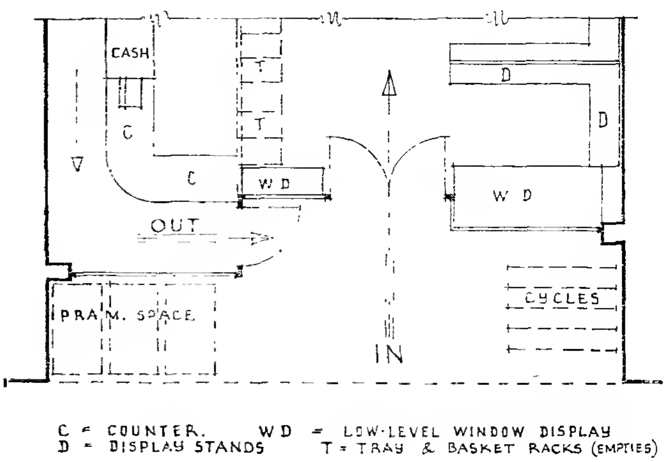
Fig. 9 illustrates a typical entrance to a small self-service shop. Provision is made for parking a few perambulators at one side and for parking cycles at the other side. The main entrance is planned directly in front of those arriving at and near the centre of the shop, whereas the exit is placed to be less obvious from outside. The control unit incorporates basket racks and the cashiers' desks at one point and, in addition, lifts to the basement for removal of goods to be delivered.

In very small shops one doorway may serve as entrance and exit, but normally it is better to keep the entrance and exit separate.

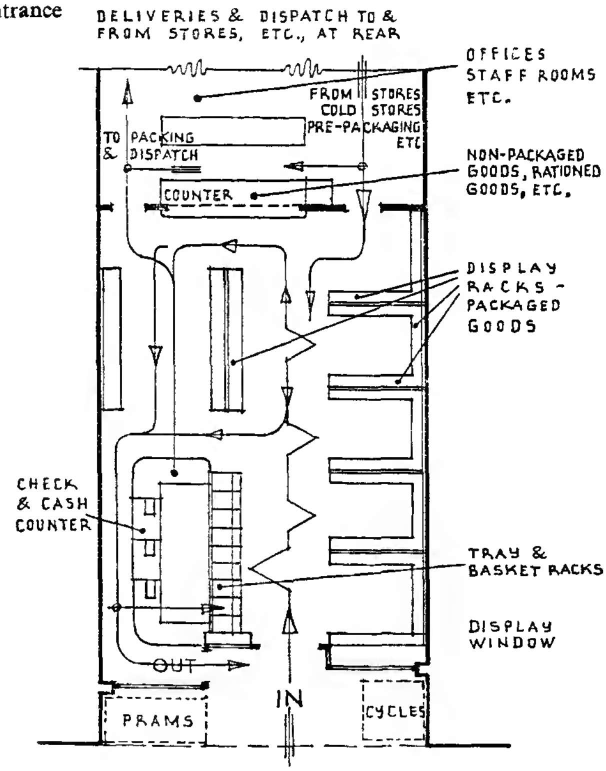
Fig. 10 illustrates a typical layout for a self-service shop in which the rear part of the building is cut off to provide space for packing and deliveries and for access to main unpacking and storage facilities, which may be in the basement or on upper floors. The back wall of the shop, between the doors to the rear portion, may be used for normal display, but is also a convenient position for handling goods which are not pre-packed and therefore not suitable for customer self-service.

It is usual to plan cash and check-points, through which the customers pass when leaving, in such positions that entrances may also be supervised.

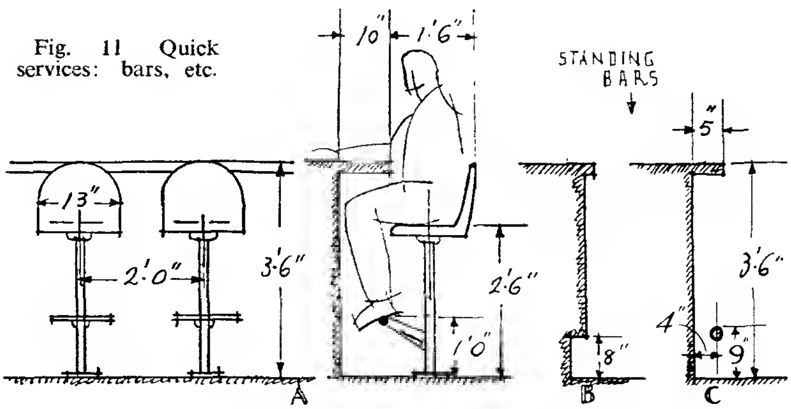
Immediately adjoining the entrances there must be well-planned basket and/or trolley storage-racks; it is helpful if these are also near the exit point, to minimize the work of transferring




Above: Fig. 9 Typical entrance




Right: Fig. 10 Typical general layout




Below: Fig. 11 Quick services: bars, etc.

baskets from the outgoing-point to the incoming-storage-racks. Widths of passageways at the cash check-point should be not less than 2ft. 3in. and not more than 2ft. 9in. and check counters should be 1ft. 6in. to 2ft. wide.

If the shop also undertakes delivery of goods, facilities must be planned to remove such goods at the check-point to a delivery collecting- and packing-space, which can be conveniently planned in the basement below the check-point and connected by a lift, conveyor or chute.

Island fittings must be kept low in height to permit full supervision; thus 4ft. should be the maximum height. These fittings are usually not more than 3ft. wide and 10ft. (or at the most 12ft.) in length.

Wall fittings may be continuous, but should not provide for goods at more than a height of 5ft., in order that they may be within the reach of the shortest adult customer. Display stands with shelves sloping back in profile from customers' circulations are usual for packaged or container goods of all kinds.

It is essential that each section of the shop and its stands be labelled clearly: such notices can be arranged above the display stands, suspended from the ceiling, or supported on local guide posts, so that the principal notices can be clearly seen from all parts of the shop.

### Parcelling and Delivery of Purchases

In many shops and stores goods are left by the customers to be delivered by the shop. Such goods are usually collected from selling-areas and passed to packing- and dispatch-rooms which generally adjoin, or even form part of, the goods-receiving department. Packing is usually carried out on benches from 2ft. 6in. to 3ft. 2in. high according to the type and size of goods handled. Racks or roll fixtures for paper, string, labels, etc., are provided over or under the benches.

If goods are taken away by the purchaser, parcelling is usually done at the selling-counter, or goods are taken to special packing-counters in the rear part of the shop and hidden from the shop by display fittings. For any but small-sized purchases to be taken away by the customer, such separate packing arrangements are desirable, in order to free selling-counter assistants for serving and to avoid delaying customers.

### Fitting Rooms

These should be attractive in appearance, easily accessible from the main showrooms and not less than 6ft. 6in. by 6ft. 6in. They should have partition walls at least 7ft. high and are better if ceiled to preclude the overhearing of conversation between the rooms. Carefully considered lighting and ventilation are essential, as well as complete equipment, such as properly placed mirrors.

### Restaurants

Many store buildings have a restaurant for the use of customers, and soda fountains and quick-lunch counters are also sometimes provided. Restaurants are usually placed on top floors, partly on account of light and ventilation, partly to avoid the risk of kitchen odours penetrating to selling areas and also because floor space is less valuable for selling purposes than on lower floors. One kitchen can generally be made to serve both the customers and a staff canteen. Occasionally soda fountains and quick-lunch counters are placed in less important areas of the main selling floors fairly near to street level.

It is desirable to have the kitchen on the same floor as, and adjoining the restaurant. The number of restaurant customers is very difficult to gauge and the floor space required is usually settled by other factors, such as using a whole floor or wing for the restaurants, kitchen and a few rooms, such as toilet and rest rooms. The restaurant and such other arrangements as are provided for catering are often regarded rather as a convenience and attraction to customers, than as producers of profits and, therefore, being of less importance than selling space for goods, should be planned accordingly. The sizes and spacing of seating and tables for restaurants are fully discussed and illustrated in the section on "Hotels."

There has been a tendency for soda fountain and quick-lunch counters to be increasingly used in some classes of shops, as less floor space is needed for service and preparation than for table service. The cafeteria, or self-service-counter type of restaurant saves in kitchen and service space, but tables occupy the same area as an ordinary restaurant. Both these methods of catering quicken service to the customer and by saving labour and floor space make lower prices possible. It is probable that all forms of counter seating are more economical from the store-owner's point of view, as there is less tendency for customers to sit gossiping than when seated at tables; against this, however, there is the disadvantage that if the food service is to be an attraction, counter methods may be unpopular.

Counters may be of two general heights, for use either with low seats about normal chair height, or with high stools or chairs. The latter are more general in this country, although the former are being increasingly installed in America; in the case of the low-seat type, the floor behind the counter should be sunk below the level of the floor on which the customers' seating is placed.

Seats at counters should be at least 2ft. apart and 2ft. 6in. above the floor when the high type is adopted, in which case the counter should be 3ft. 6in. above the floor, as shown in Fig. 11. It is desirable to provide backs to the seats, and also foot rests. Low-type counters should be 2ft. 6in. above the floor, and the seats 1ft. 6in. high. In some continental restaurants high seats have been designed to fold back against the counter front, so that customers may stand at the counter if they prefer it. Counters for consumption of food only (that is, without service equipment forming a part of them) generally vary in width from 1ft. 4in. to 1ft. 8in., and need 3ft. 8in. to 4ft. width behind them for service space.

If a soda fountain or similar fixture is incorporated with the counter, the width occupied is about 3ft., with the counter top itself projecting a further 6in. Soda fountain, tea, coffee and sandwich counter units average about 10ft. to 12ft. in length.

### Public-Service Rooms

Toilet facilities for customers of both sexes should be provided in all large shops and stores; greater provision is required for females than for males in

ordinary stores. It is usually best to plan toilet rooms near the restaurant, if there is one, but they should always be grouped together in one place, rather than providing facilities on several floors. It is general to provide a rest room for female customers in conjunction with the toilet rooms and this room generally has facilities for seating a number of persons at one time and also for writing. Toilet rooms should be divided into separate rooms, one for use as a cloakroom where clothes and parcels may be left, another for the lavatory, with ample basins, powder tables and mirrors and a third for W.C.s. It is important that these rooms should be made as pleasant, attractive and comfortable as possible, at the same time bearing in mind in choosing materials that they are constantly used by large numbers of people, which makes for heavy wear and tear.

### Children's Room

Occasionally, to relieve parents of the difficulty of looking after children while shopping, a children's playroom, fitted with toys, such as slides, as well as ordinary loose toys, is provided, with a nurse in charge. This is useful for shoppers, but is non-revenue producing and can only be placed in a position of little value for selling purposes.

### Hairdressing Departments

Hairdressing departments for men and women are generally separated, though occasionally they share a common waiting-room. These rooms are usually placed on upper floors, but in some shops the basement is used.

The women's department generally consists of a large open space, around which are cubicles; the centre space serves as waiting-room and sales space for goods, such as scents and beauty preparations. In this area should be placed also the cashier's desk and appointment bureau. A special room for children is often attached to the women's department and this is generally an open room with several barbers' chairs. Cubicles are usually about 6ft. 3in. wide, and should be at least 7ft. deep, preferably more, with partitions at least 7ft. high on the sides and either a similar partition with a door, or sometimes only a curtain at the back. Fig. 12 illustrates a typical cubicle for ladies, with its average dimensions. The main fixed equipment is the chair itself and a large lavatory basin with mirrors and shelves round it, with floor space to accommodate portable hair-driers and permanent-wave equipment.

A men's department usually has the chairs placed in a large room, and not in cubicles, except for one or two set aside for chiropody. Basins are placed round the perimeter of the room, with the chairs placed opposite to or between them, the latter allowing larger mirrors to be used. Fig. 13 illustrates the average spacing required for the chairs and the spaces needed between. It will be seen that the chairs may be placed closer together when each has its own basin, but the spacing has to be increased if the basins are placed between the chairs; in the latter arrangement frequently only one basin is provided between two chairs and then also alternate chairs only need the wider spacing. If chairs are placed on both sides of a room, at least 10ft. should be allowed from centre to centre of the chairs to permit circulation when they are used in a reclining position and fully extended. The placing of the basin between two chairs also allows more space for shampooing.

Waiting space is required, and is most satisfactory if arranged as a separate room, rather than by placing chairs in the main room; in this waiting-room may be the cashier, appointment clerk, sales stalls and also a cloakroom where coats and hats may be left, which is more satisfactory than simply providing hat- and coat-stands in the barber's room.

Changing rooms with bathrooms are sometimes attached to men's hairdressing departments, and should have an area of about 60sq. ft.; two changing rooms may conveniently share one bathroom if a basin is placed in each changing room.

Daylight is not necessary for hairdressing departments, but well-arranged artificial light is essential. A room is required for the staff for changing and waiting between serving customers; it should contain lockers for each member of the staff and lavatory basins. Rooms are also needed for sterilizing brushes, combs, towels, etc., and for mixing washes and lotions. The former should be equipped with a small sterilizer and a sink with ample draining-board space; the latter needs cupboards for storage of bottles and a long bench with plenty of shelving above. The plumbing and services required are considerable and it is therefore wise to plan an access passageway, in which all services may be placed, immediately behind the wall to which the basins are fixed. This passageway is also often used for the collection of dirty towels, etc., from containers placed near the basins. Each chair requires electricity as well as hot and cold water. Towel heaters are also needed, which may be heated by steam when available, otherwise by gas or electricity. To avoid breakdowns and heavy maintenance charges, very good quality equipment and installation of services are of extreme importance. If a central vacuum cleaning installation is provided numerous outlets should be placed in these departments for the rapid cleaning of the floor.

### Administrative Department

Except for small departmental offices, which are generally placed on each floor, the offices and other rooms for administration purposes are generally placed at the top of the building, where space is least valuable. The public does not as a rule need to go to the offices, except for certain purposes such as arranging accounts, correction of errors and general information, for which purposes a separate office is frequently provided on a lower floor. The main sections of the offices are the directorate, secretariat, bought-and-sold ledger, accounts and post departments, advertising, telephone exchange and maintenance. They should all be close together for easy supervision, but relative sizes vary considerably according to the type of trade handled in each store. (*See* section on "Office Buildings.")

### Staff Rooms

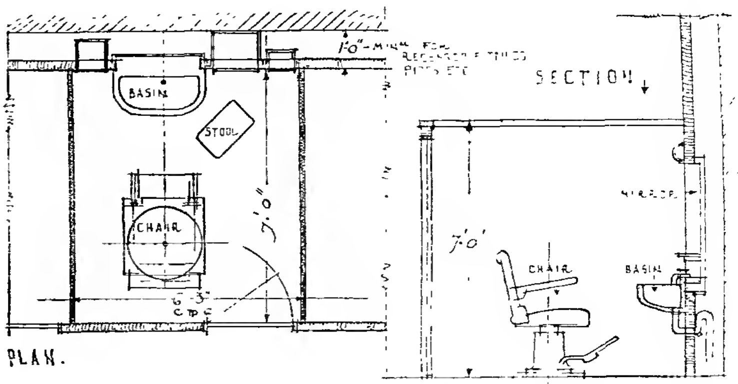
Employees should have their own entrance, entirely separate from customers' entrances. It should have an office for supervision, near which are often placed offices for staff and employment managers. Staircases should lead directly from the entrance to the locker

rooms, which are generally in the basement and are therefore artificially lighted and ventilated. Each member of the staff should have a separate locker in which to keep his clothes. Many employees change their clothes on arrival, and locker rooms should provide enough space for this purpose. Fig. 14 illustrates typical sizes and spacing of locker rooms; lockers are made in various sizes, but a good average size for the constant storage of indoor or outdoor clothes is 1ft. 3in. square, and about 6ft. 6in. high, to give space for hats above, and shoes below hanging clothes. Diagrams B and C illustrate the minimum spacing between rows of lockers; Diagram B provides a central circulation space which is needed if many lockers are placed in a row. Lockers are generally of metal, should have ample ventilation and be raised a little above floor level both to allow air to circulate and for easy cleaning.

Staff lavatories are sometimes placed together on one floor, generally the basement, but it is more usual to place them on each floor and arrange approach from the service staircases in order to reduce noise; the latter placing saves employees' time and considerable traffic on staircases and in lifts. In many stores the number of female staff often greatly exceeds that of males and therefore on many floors provision is not made for male staff-toilet rooms, which are placed on alternate floors, or only on the top and lowest floors. The number of W.C.s required by the Factory and Workshops Act is one for every 25 females; for males, one for every 25 up to 100, and one for every 40 thereafter; in buildings of the store type, it is, however, general to provide more than this number and a basis of one W.C. to every 15 persons is more satisfactory. Lavatory basins should be provided in about similar proportion. Natural light and ventilation are desirable in lavatories. (*See also* Part 1: Sanitation.)

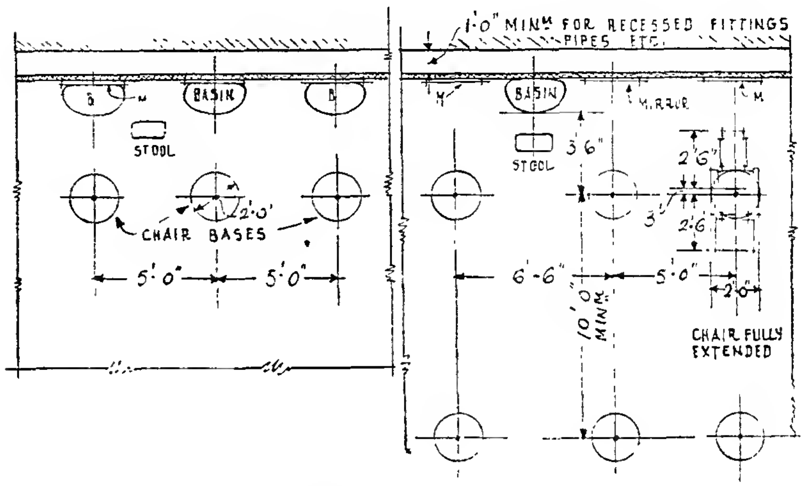
### Shop Fronts

Shop fronts are governed by building regulations, particularly in the London area, where the whole façade of a building is subject to a regulation that the total area of the openings above the ground story must not exceed one-half




Above: Fig. 12 Hairdressing department: women's cubicles

Below: Fig. 13 Hairdressing department: spacing data for men's room



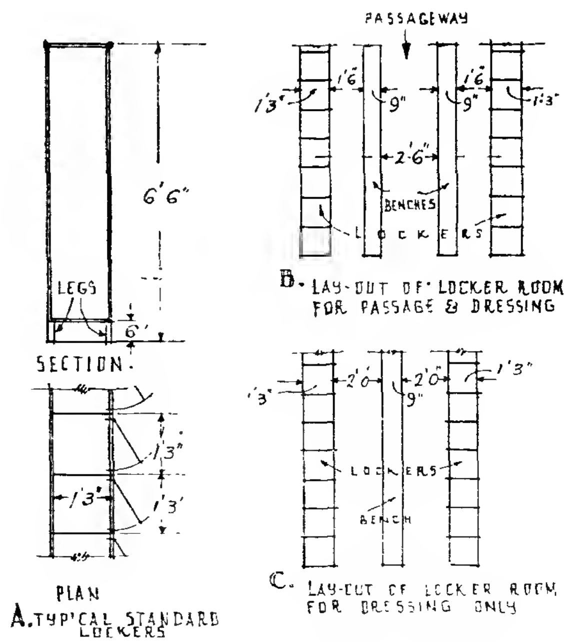




Fig. 14 Staff locker rooms

of the total area of the wall: it is not stated, however, that the openings may not be continuous glass bands, either horizontal or vertical. In streets of a width not greater than 30ft, as shown in Fig. 15 A, shop fronts may not project beyond the external wall of the building more than 5in., and cornices to such shop fronts not more than 13in.; in streets of greater widths than 30ft., as shown in Fig. 15 B, shop fronts may project up to 10in., and their cornices up to 18in. beyond the external wall; in either case no part of the shop front (except the cornice) must project over the public way or any land to be given up to public way. In London, as shown in Fig. 16 B, no part of the woodwork of any shop front may be fixed higher than 25ft. above the level of the pavement. No part of the woodwork shall be fixed nearer than 4in. to the centre of the party wall or nearer than 4in. to the face of the wall of the adjoining premises when there is not a party wall, unless a pier or corbel of incombustible material at least 4in. wide is placed as high as such woodwork, and projects one inch at least in front thereof between such woodwork and the centre of the party wall, or the separate wall, as the case may be (*see* Fig. 16 A). It is important that adequate provision be made for the removal of water from cornices or projections over shop fronts to prevent dripping on to the public way.

Fig. 17 illustrates eight typical shop front plans, each with entrances of various types, four of which, Diagrams A to D, are deeply recessed to increase areas of display window. All the types shown are for single shops between party or external walls, but the principle illustrated may well be used elsewhere.

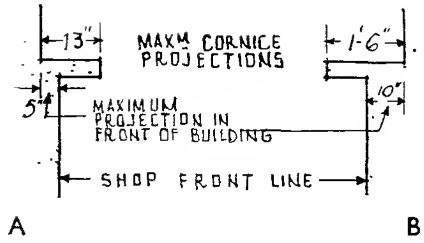
Type A shows a wide entrance leading to two separate doors divided by a showcase, but it has the fault that persons cannot look into the central showcase without blocking the entrance doors ; the side display windows are shallow and, therefore, not suitable for all trades. Type B has a central showcase placed on the frontage and only one doorway is provided to the shop; the show windows are deeper, but the approach is cramped. Types C and D each have an entrance door placed to one side, thus permitting more window space with much greater window depth in the latter. Of the shallow recessed types, Example E has a central entrance with splayed windows on each side, whereas Type F places the entrance to one side but still uses the splay to direct towards the door. Type G has only two comparatively small show windows, but has additional windows on each side of the door which make the whole shop a display. Type H provides the maximum depth of display which can be obtained in shallow recessed types.

Fig. 18 illustrates two examples of arcaded shop fronts; these restrict the amount of ground-floor space available for the shop itself, but provide increased area of display windows and cases, frequently desired by shopkeepers. Type B may be slightly better as the actual shop entrance is more visible to passers-by. In all types of shop entrances and deeply recessed entrances, provision must be made for closure at the frontage line at nighttime. The arcade type of shop front should not have passageways so narrow that customers are unable to pass those looking at window displays. Artificial light is always needed for the back parts of deeply recessed types, particularly when showcases are placed near the frontage. Glass curved on plan is not very satisfactory owing to the difficulty of seeing the contents of the window due to reflections.

Fig. 19 illustrates four typical sections through shop fronts; these examples summarize essential points in connection with placing fascias, blinds, transoms and stallboards. Shop windows may be roughly divided into two main types, those with a permanent background and those without; in the latter a full view of the shop is available from the pavement and this increases the display area, but its use is, of course, limited to certain trades only.

Backgrounds, when used, may be permanent, in the form of walls or panelling ; or only temporary or movable screens; these backgrounds sometimes extend the full height of the shop, as in Diagrams A and B, or they may be stopped by forming a ceiling at a transom height as in Diagrams C and D, which permits either the lighting of the shop by clerestory means or the use of the upper portion of the shop front for display purposes, lettering and artificial illumination.

The level of the floor of the shop window in relation to the pavement varies, mainly according to the type of trade. It is usually raised from a




In streets less than 30ft. wide — In streets more than 30ft. wide

Fig. 15 L.B.A. regulations for projections of shop fronts

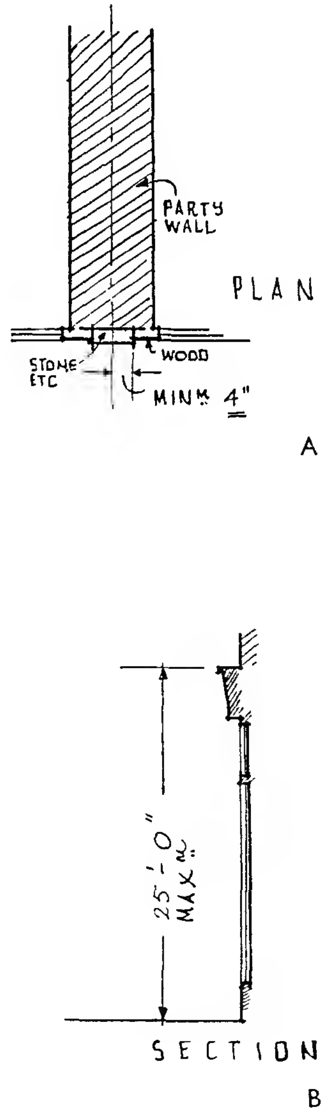



Fig. 16 L.B.A. regulations for wood shop fronts

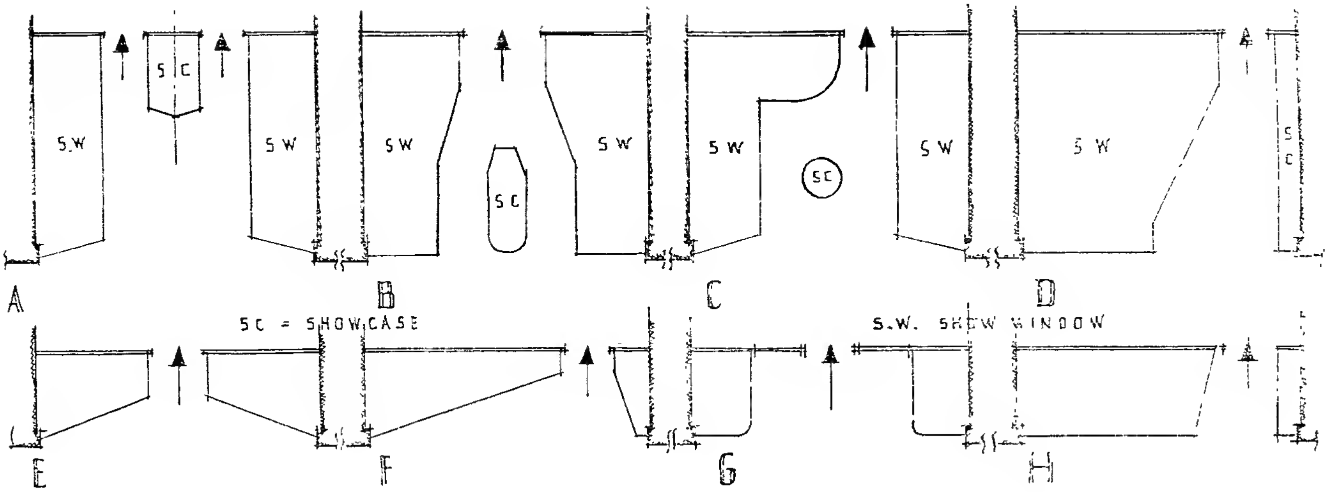



Fig. 17 Types of shop front: shallow and deeply recessed

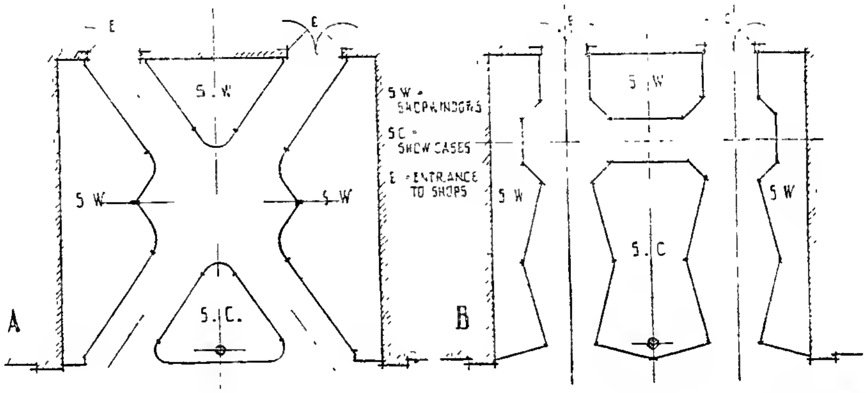



Fig. 18 Typical arcaded shop front plans

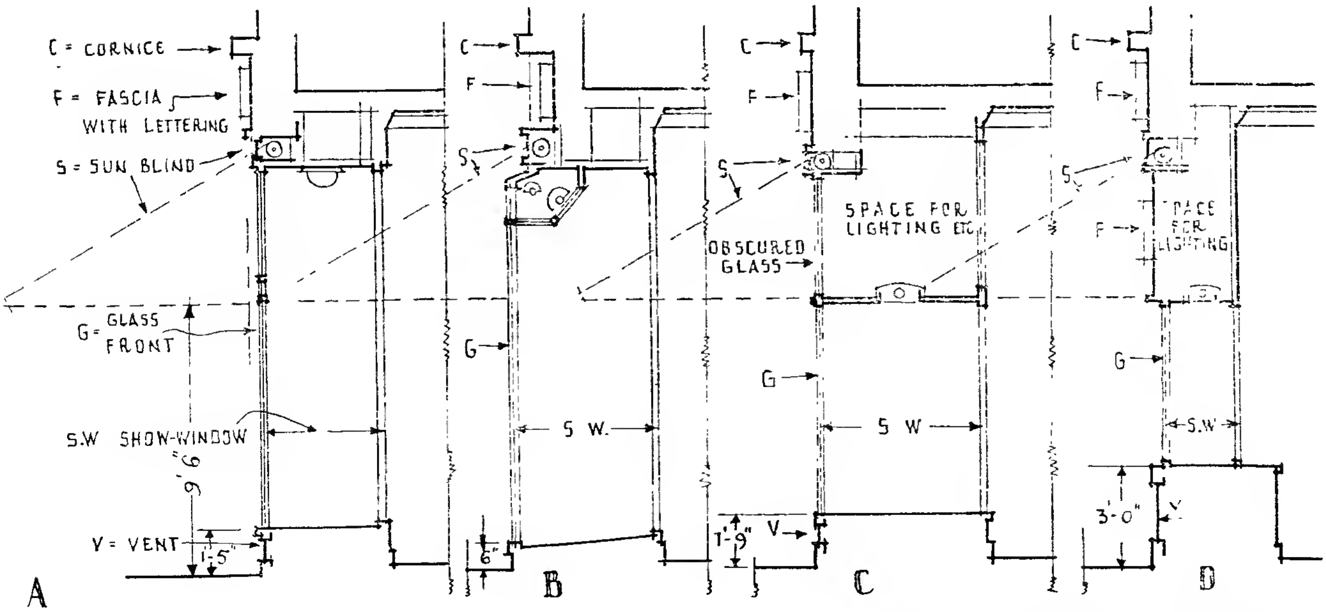



Fig. 19 Typical sections, etc. of shop fronts

minimum stallboard height of 6in. up to as much as 3ft. 6in., the average being about 1ft. 4in. Generally speaking, higher types are used for articles such as jewellery and are not of a great depth. Where deep windows are required it is necessary that the floor level is not much raised. Ventilation may be provided through the stallboards to the basement, as suggested in Fig. 19.

The window floors are usually flat, but occasionally are slightly inclined towards the pavement as shown in Diagram B. The lowest glass of the window should be at least 6in. above the outside pavement and preferably rather more; transoms may satisfactorily be placed about 9ft. 6in. above the pavement, at which level a ceiling may be formed as in Diagrams C and D, but if windows are deep, greater height is desirable to ensure adequate light on objects near the background.

Sunblinds are essential for most trades if the aspect is such that goods displayed in windows may be damaged by direct sunlight at some time during the day. The position of name fascias above or below blinds has not been agreed except by using both positions; if the name is above the blind, persons on the pavement cannot read it and if below, those on buses or trams or on the opposite side of the street cannot see when the blind is down.

It is essential to have easy access to shop windows to facilitate the handling of large objects to be displayed, particularly furniture, screens and display equipment. The lighting of shop windows must be carefully considered so that fittings may be incorporated in the scheme and not have the appearance of an afterthought. The diagrams in Fig. 19 show various common types of lighting for shop windows, but in addition to the lights at the top of the windows others are frequently placed at the sides or at floor level and shielded by name plates or continuous reflectors.

Fig. 20 illustrates the placing of the glass line of display windows in stores and large shops in relation to the building line. Type A is the normal position where the glass is approximately flush or very slightly set back from the building line. Type B shows the projecting type (as permitted by the L.C.C.), which allows a continuous shop window. Type C, semi-arcaded, gives some protection both from weather and passers-by to those looking at window displays and presents a

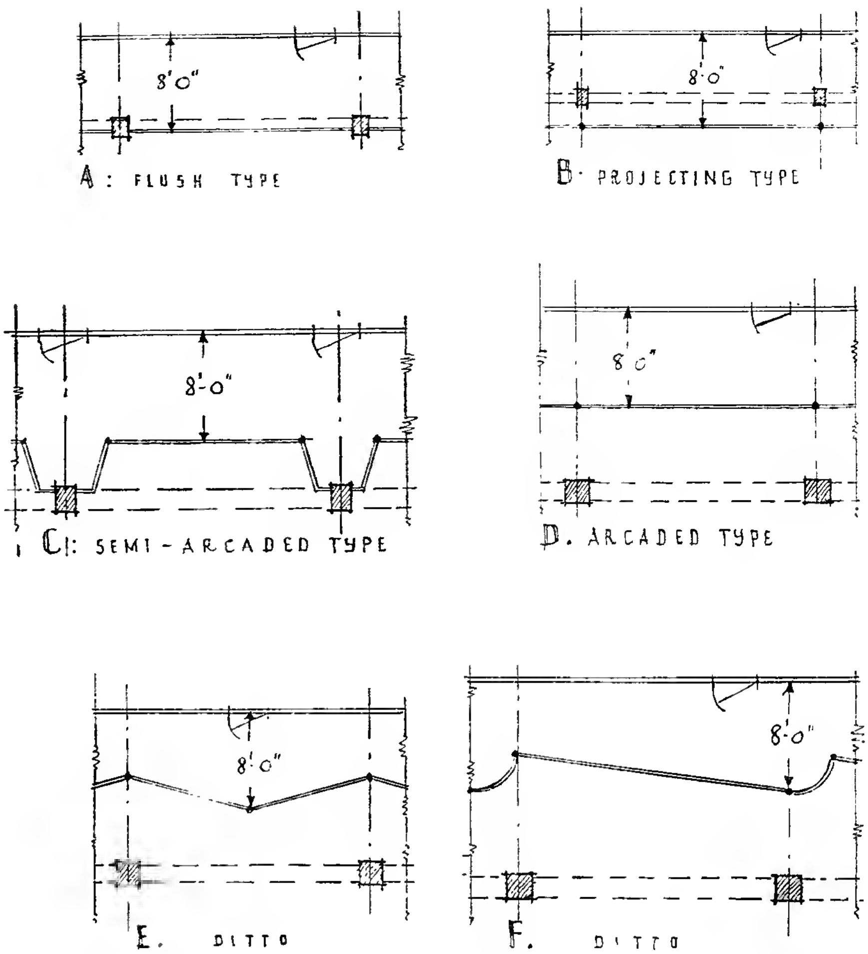



Fig. 20 Show windows for store buildings

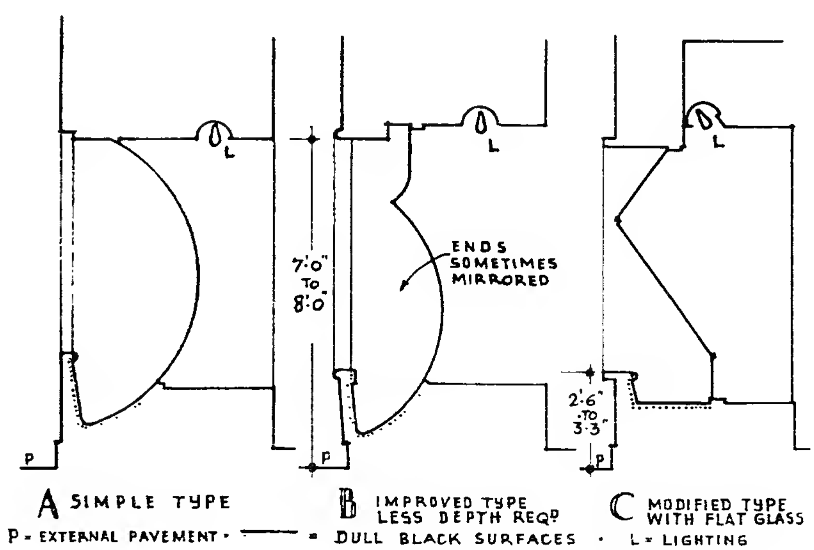



Fig. 21 Non-reflecting shop windows

window face more or less directly in front of those approaching in either direction, a point of considerable value. Types D, E and F are variations of the arcade type, in which the display windows are set back from the frontage. Types E and F have advantage for display purposes and Type F is useful as a direction indicator towards the entrances.

There is variance of opinion as to whether windows should be continuous or divided into bays by fairly substantial piers; to some extent it is dependent on the type of trade; on the whole, however, it seems that separate windows are more satisfactory when varied window dressing and displays are required for different departments.

Windows about 15ft. to 17ft. wide seem the most satisfactory, and these may be planned very conveniently with a 20ft. to 22ft. column spacing of structural planning. Windows vary in depth from 2ft. to 12ft. or even 15ft., but the average is about 8ft., except for the exhibition of large articles such as furniture. One factor which should be borne in mind in designing windows is the maximum normal commercial sizes of plate glass, which are: for $\frac{1}{4}$ in. thickness, 165in. by 110in.; for $\frac{5}{16}$ in. thickness, 180in. by 130in.; and for $\frac{1}{2}$ in., 280in. by 120in. Larger sizes up to 288in. by 168in. ($\frac{5}{8}$ in. thick) can be obtained by special order.

One problem in shop window design is the reflection of objects in or across the street masking goods on exhibition. Deeply recessed show-windows are particularly liable to this fault. Several ideas have been put forward to overcome the trouble, some of which are based on the principle of curving the glass, as shown sectionally in Fig. 21 A and B; by curving the glass in this way, the rays of light falling upon the surface of the glass are reflected away from the eye.

An alternative is to use flat glass set at an angle to the vertical as shown in Fig. 21 C.

**Blinds**

Blinds are also controlled in many districts by regulations; the L.C.C. require that any movable sunblind, its stays or fittings, excepting the valances or side blinds overhanging the public way, shall not, when open, be below an imaginary line drawn from a point 7ft. above the pavement at a point 2ft. from the outer edge of the kerb to a point 7ft. 6in. above the footway adjoining the front of the shop. These dimensions are illustrated in Fig. 22.

**Signs, etc.**

The Town and Country Planning (Control of Advertisements) Regulations, 1948, require consent to be obtained for all advertisements or signs except for certain very limited types. Advertisements include all nameplates and the framework or hoarding on which they are displayed which can be seen from outside. On business premises advertisements may be fixed without consent on any external face of a building, except in special control areas, if not more than 15ft. above ground level and if letters, figures, etc., do not exceed 2ft. 6in. in height.

Other local regulations also influence the display and placing of signs. The following summarized L.C.C. requirements are typical:—

Signs, or structures supporting them, must not be fixed less than 8ft. clear above the pavement, or be nearer the carriageway than 2ft. 6in. from the outer edge of the kerb, or project more than 4ft. from the wall or shop front. If they extend more than 2ft. along the face of the building, then 2ft. is the maximum projection allowed; signs shall not be more than 2ft. 6in. in height nor extend more than 6ft. in any direction. Seven days' notice is required by the L.C.C. before fixing any lamp, sign, or similar structure. Fig. 23 C summarizes the main provisions of these clauses. The regulations require that lamps and structures overhanging the public way shall be at least 8ft. clear above the footway and not nearer the kerb than 2ft. 6in., nor projecting more than 5ft. from the front of the premises, as shown in Fig. 23 B. Lamps must not exceed 3ft. in any part, measured horizontally over all, nor must weight exceed 84lb., and there must be a secondary means of support. There are, however, various exemptions to the foregoing clauses, particularly with regard to lamps, which may be fixed 7ft. 6in. in the clear above the pavement, not projecting more than 3ft. beyond the line of the window frame and not nearer than 2ft. 6in. to the outside of the kerb, if they are used solely for the purpose of illuminating

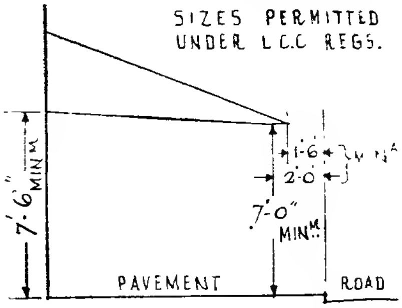



Fig. 22 Sunblinds

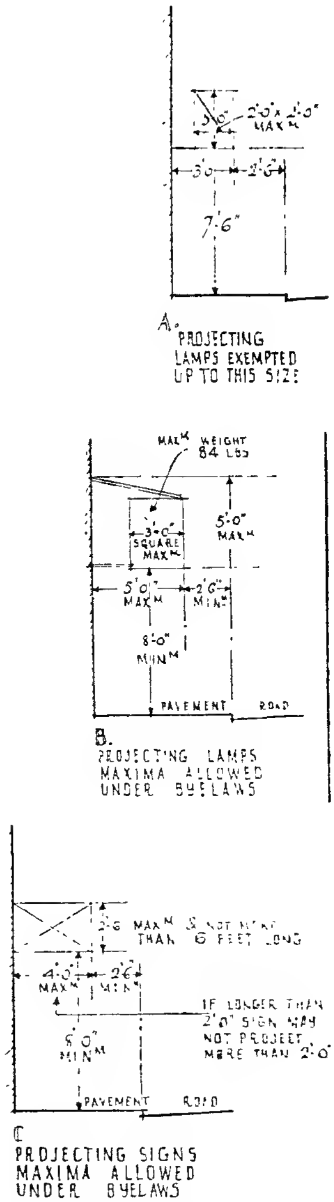



Fig. 23 L.C.C. regulations for projecting signs and lamps

such windows from without. Lamps must not exceed 36in. in height, 24in. in width parallel to the face of the building, or 24in. in depth, from front to back in the clear, as shown in Fig. 23 A.

There is a clause that the L.C.C., after consultation with the local borough authority, may in any case in which it may consider it expedient so to do, dispense with the observance of any of these by-laws.

### Marquises

The L.C.C. and most other local authorities now allow continuous marquises or canopies over shops irrespective of whether the shops contain restaurants or other places of public resort.

Although there is no specific wording in the L.B. Acts, to authorize such structures, special application can be made under Section 79 of the Act. In connection with any such application it should be noted that (a) no supports will be allowed from the footpath (as have sometimes been allowed heretofore); this implies a cantilever design. (b) The whole structure must be constructed of fire-resisting materials. (c) The projection over the public footpath is governed by the widths of the footpaths and the streets; for example, in a street 40ft. wide and over, the projection of the canopy may not be nearer to the edge of the kerb than 2ft. 6in., or in a 30ft. wide street this distance may be required to be increased to 3ft. Such allowances are judged, upon application, on the merits of a particular case. (d) Some provision for artificial lighting must be made in the soffits of the canopies (it is possible, however, that under certain circumstances, this requirement may be waived).

It should be noted in connection with continuous marquises that in consequence of the height above the pavement and the low type of stallboard to shop windows now in vogue, some provision may have to be made for blinds of the roller type to drop vertically near the extreme outer face of the canopy to protect the lower parts of the windows from sun, in particularly exposed positions. In such cases, the ordinary regulations governing the height and projection of sunblinds come into operation.

### Lighting

Artificial lighting has great influence on sales; it must be carefully planned in relation to display windows and to internal layout. It should be related to the type of goods displayed both internally and externally. For general sales areas the intensity should be at least 15ft.-candles at 3ft. above the floors; this general level can well be increased over counters, and up to 40ft.-candles for special displays. Care should be taken to reduce shadows to a minimum and to ensure that the colour of light is suitable for the type of goods displayed.

Time-clocks for controlling display window lighting are often required; internal pilot lighting and even auxiliary lighting from an independent source, such as batteries, may sometimes be required where large stores are patrolled at night or have other night staff operating.

### Heating

Too low a temperature may be detrimental to the comfort of the sales staff, whereas in some departments or shops, such as those selling perishable goods, high temperatures may cause damage. Large shops and stores are usually central-heated, but smaller ones often depend on unit heaters or other types of local sources of heat by electricity or gas. The placing of appliances and radiators must be carefully planned in relation to fittings, counters and special displays.

In large store-buildings central heating is often by means of low-pressure panel heating; some sections of such buildings may be heated by means of combined heating and ventilating plenum systems. The latter can be arranged to cool certain departments in summertime. Some types of smaller lock-up shops are now being heated by means of electric elements built into sub-floors.

### Ventilation

Mechanical ventilation is often necessary in large shops and stores but seldom in smaller shops.

If basements are used for storage, or as selling-space, ventilation then becomes essential.

### Refrigeration

Some departments may require refrigeration; this can be by means of local fittings near the selling areas. Where large storage is concerned, cold rooms and central refrigerated stores, at varying temperatures, may have to be provided in a basement and/or connected with the main goods receiving and storage sections of the building.

### Cleaning

Many large shops and stores install central vacuum-cleaning plants, but the majority depend on portable electric cleaners, which necessitates a well-considered layout of electric-socket outlets in order to cover the whole floor area.

Many food shops need distributed facilities for water and drainage for constant washing of floors, counters and display fittings.

### Protection Against Theft

Detailed consideration of measures against theft and larceny are necessary early in the planning of shop-fronts. Precautions, such as the introduction of bars or gates to windows, doors, and skylights, often affect design, and burglar alarms should not appear as after-thoughts. In many shops strong-rooms have to be planned and special construction may be needed.

### Fire Protection

In small shops protection is generally met by the provision of portable extinguishers. In large shops, however, sprinkler systems are usually installed; these need attention in the early design-stages, so that tanks, mains and distribution systems may be incorporated efficiently, and unsightliness avoided. Fire protection should be discussed very early in the planning stages with both insurance companies and the local fire authorities.

### Entrances to Floors Over Shops

Entrances for access to upper floors need special consideration if lettings are separate from shops. If both are in one occupation a separate entrance

may not be needed, though such may be placed inside the display windows as shown in Fig. 24 A.

The arrangement shown in Diagram B, with a combined entrance for separate lettings, has the same disadvantages as Type A, except that the entrance to the upper floors is more open and more easy to find. The practical solution appears to be separate entrances to both shop and upper floors, as in Diagram C, although this involves treatment of two similar entrances in different ways: a factor of design not easy to resolve satisfactorily.

Fig. 24, Diagram A, also illustrates a means of providing back access to isolated shop windows. Island showcases require access doors built-in as part of the cases.

**Arcades**

Pedestrian shopping arcades are frequently used for deep sites which, owing to cost, need a greater amount of development than can be provided by building up only the frontages. Shops in these arcades are generally small and of "lock-up" type; back access is seldom possible. It is common to provide this type of shop with a mezzanine floor approached by a very small internal staircase in each unit, as shown in Fig. 25 A; mezzanine floors raise the height of the arcade and improve the lighting and ventilation. The shops are generally based on a small frontage unit of about 12ft. to 15ft., sometimes as small as 10ft.; the heights allowed are usually about 11ft. or 12ft. in the clear for the ground floor and about 9ft. for the mezzanine.

The width of the arcade between shop fronts must vary according to the length, but the minimum width should not be less than 12ft., for it must be remembered that most arcades are used as throughways for pedestrians as well as for shopping. Arcades should be open at both ends and connect to main streets; arcades in fact largely depend for rental value on the number of people using them as a means of communication.

Arcades are generally closed at night at each end. They must be well lighted artificially because their position does not usually admit adequate daylight except in very bright weather or may allow no daylight. They usually depend on through passage of air from the ends for ventilation, if short, but when long, some top ventilation is essential. This may often be provided through internal lighting wells or areas of the buildings above, as shown in Fig. 25, Diagram B. This figure illustrates four typical sections through arcades. It is convenient to have basement storage spaces available for each shop and this can easily be provided underneath the arcade itself, as shown in the diagrams.

The section illustrated in Diagram A is for use when there is a long open area available in the upper part of the building which permits constant daylight for the arcade; whereas Type B depends on artificial light, with, perhaps, small light-wells at intervals in its length. Type C is an example where shops are placed on two levels, the upper one being served by balconies. These balconies should be at least 8ft., and are better 10ft. wide; staircase approaches to upper floors are needed near each end, and, if the arcade is long, at intermediate positions, in each case being about 4ft. 6in. wide and placed between shops. Type D is frequently used abroad; it is roofed with glass at the top of the main building, and has the windows of upper floors overlooking the arcade; it has the advantage of greater air space and consequent better ventilation, but there is an increased risk of fire in connection with the upper floors.

An important consideration in planning arcades is the sanitary accommodation for use of the shop staffs; it is generally impossible to provide the accommodation in each shop owing to the difficulty of obtaining the necessary ventilation areas, although this might be overcome now that mechanical ventilation is often approved. The usual practice is to provide grouped accommodation for each sex at some convenient position in the arcade, placed behind the shops and approached between them, or to place the groups in the basement in some situation where ventilation is possible by continuing upper-floor light-wells down to basement or ground-floor level. It is important that such sanitary accommodation be placed in some unobtrusive position to avoid use by the public.

## ENTRANCES TO UPPER FLOORS, ARCADES, CAR PARKING

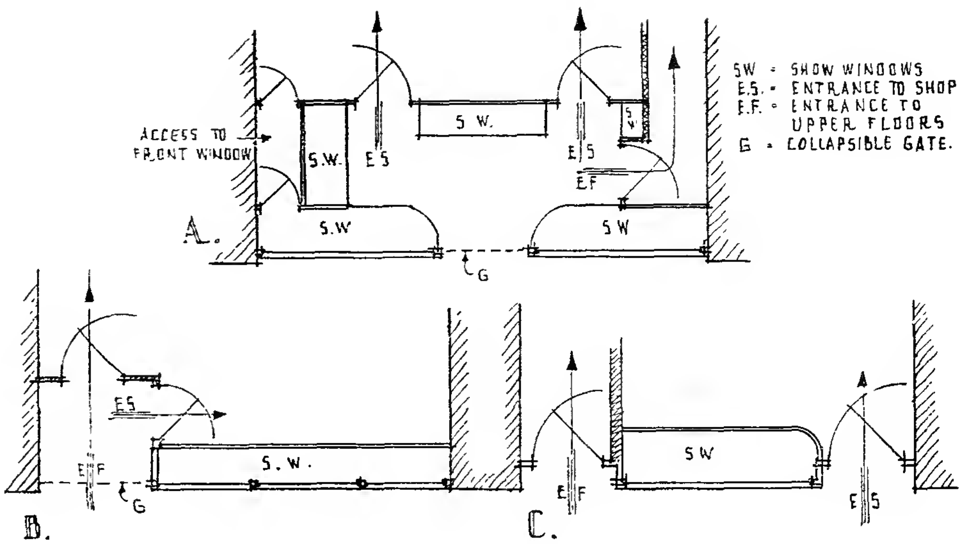



Fig. 24 Entrances to upper floors

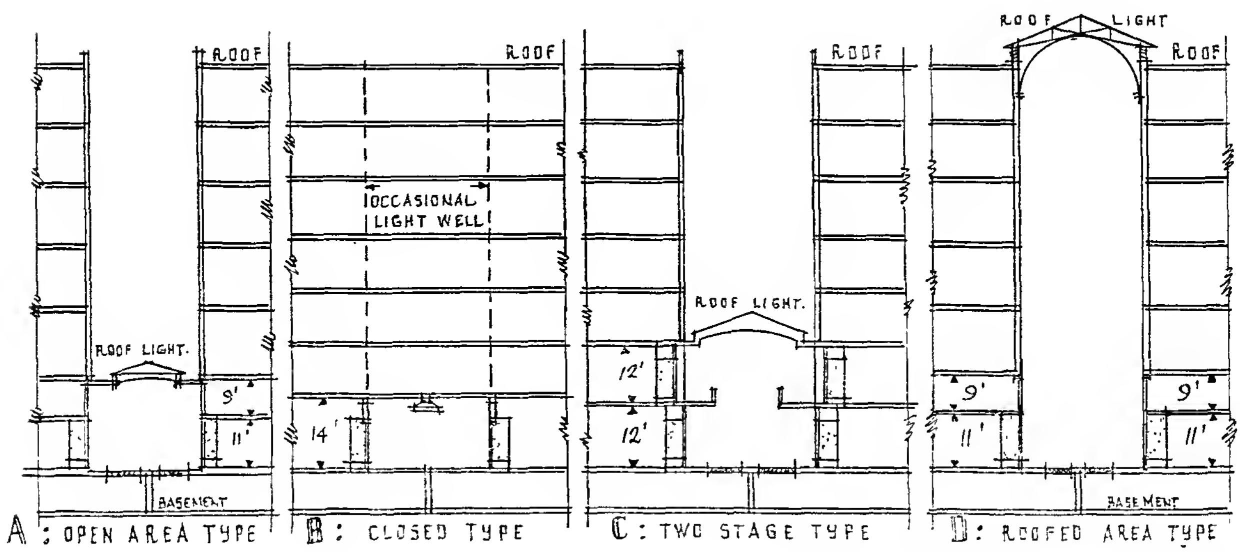



Fig. 25 Types of section for shopping arcades

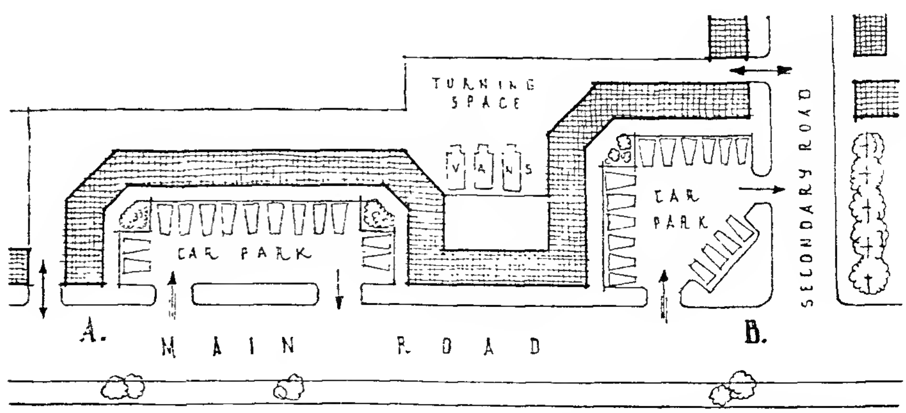



Fig. 26 Suburban: car parking, etc.

**Small Suburban Shops**

The data previously given apply in the main to suburban shops, but there are a few special considerations, such as the parking of customers' cars, for which provision can be made in new suburban developments: this, owing to the value of sites, is impossible in urban schemes. In all new development schemes proper provision should be made for cars.

Fig. 26 shows methods of development with parking facilities off the main road and is in two parts, showing the scheme applied to corner sites and normal straight frontages and a combination of the two. In the combined scheme, as illustrated, provision is also made for the handling of trade vans in the rear part of the site behind the shops, where they are screened from view and do not interrupt front or customers' entrances to shops, as so frequently happens.

The corner treatment is not only useful in dealing with the parking problem, but, owing to the opening up at the junction of the roads, traffic from the side has a better view of the main road. It should also be noticed that these schemes provide a greater amount of main-road shop frontage and consequent increase in value, although greater land area is needed; but length of shop frontage is generally of greater value than land area in such situations.

Back access to suburban shops is really essential and by its provision accommodation may frequently be arranged for the garaging of vans and for storage. Sites should, therefore, where possible, be chosen of sufficient depth to accommodate both shops and the necessary yard space at the back (or sides) of the shops.

The sizes of suburban shops vary considerably, the frontages being from 10ft. to 25ft. wide, with an average of about 16ft. Narrow shops are often wanted for certain trades, but it is advisable to plan schemes with varying sizes of shop in order to avoid disorderly subdivision of standard frontages. Depths vary from about 30ft. to 60ft., with an average of about 45ft. on the ground floor.

Upper floors, sometimes used as show- or store-rooms, but more generally as flats, are usually of shallower depth, thus permitting lantern or pavement lights for the back parts of the shops. Basements for storage purposes are not always provided, as cost does not seem to be justified by the increased rentals. If upper floors are used in connection with each shop, direct access is usually provided by staircases against one side; but when used for living accommodation, access is usually external, as the flats are frequently let separately. Methods of access to flats over shops are discussed in the section on " Flats."

Sanitary accommodation should be provided in each shop, and should take the form of lavatories and separate W.C.s, sometimes placed in the rear part of the shops, and approached from a small lobby, or the lavatory itself forms the lobby, or they may be placed outside the shop and planned in conjunction with the back access yard. Sanitary accommodation for customers is not generally necessary.

**Introduction:**
**Local Government administration**

Administrative headquarters are needed for the following: Parish Councils, Rural District Councils, Urban District Councils, Borough Councils, County Borough Councils, City Councils and County Councils.

The requirements for these different bodies vary: their amount and size increases in the order given.

Even if Parish Councils have established office quarters, it is quite usual for the Council and its Committees to meet in some place normally used for other purposes.

Rural Districts often cover large areas in which there may be a number of Parish Councils; they administer their areas in all those matters not covered by County Councils, or by Urban District Councils or the Borough Councils which may be within their boundaries. The chief officer is the Clerk of the Rural District Council and the elected head is the Chairman of the R.D.C., who presides over an elected Council. The offices of the R.D.C. are usually near the centre of the area in one of the larger urban centres of the district.

An Urban District Council administers the affairs of what are usually the smaller towns and has Council Offices in which all its departments have quarters and the meetings of Council and Committees take place. The chief officer is the Clerk to the Council and the elected head of the Council is the Chairman of the U.D.C.

Borough and County Borough Councils are broadly similar in scope, with their own offices, Council and Committee accommodation centred on a Town Hall or Municipal Offices. The chief officer in each case is the Town Clerk and the head of the Council is the Mayor; there is a Deputy Mayor and a number of Aldermen, all being elected members of the Council. Boroughs have fewer departments than a County Borough, the main differences being that education and town and country planning are administered by County Boroughs and Counties and not by Boroughs.

City Councils are much like County Borough Councils, in so far as administrative requirements are concerned, but usually have rights and privileges specially granted or acquired over the centuries. The elected head and chief citizen is the Lord Mayor; there are usually one or two Sheriffs; there is a Deputy Mayor, a number of Aldermen, in addition to the Councillors, all of whom are elected. The chief officer is the Town Clerk.

County Councils are usually larger bodies than any of the above, and function from County Halls, generally situated in or near the "capital" or chief market town of the County. The Council is presided over by the Chairman of the County Council and there is a Deputy Chairman and a number of Aldermen. The chief officer is the Clerk of the County Council.

The above outline applies only to England and Wales: Scottish authorities differ considerably in administrative organization, in the titles of officials and other matters.

This section is limited to requirements of municipal offices and town halls, although in many towns there are often other buildings, such as police courts, fire stations, libraries and showrooms for municipal undertakings, grouped with either or both of these.

Municipal offices are in most respects similar to those of any large commercial undertaking and have much in common in general planning. It should always be recognized, however, that municipal offices which contain a council suite will have two main functions to be considered: (a) ceremonial side connected with the council and its committees and with receptions and civic functions of the Mayor or Lord Mayor, sheriffs, etc., (b) administrative business of the council, the services of the town, and the proportion of government administration allocated to local authorities under various Acts or departments. In considering these two main divisions it must always be remembered that, if the ceremonial suite or circulations are being used for civic functions, the administration side of the building must always be able uninterruptedly to carry on its business.

Town halls are, in a strict sense, assembly halls for the public. Such halls are used for very varied purposes, as far apart as trade exhibitions, public dances and conference meetings.

**Offices**

A municipal office building for a borough may be roughly divided into the council suite, four main departments, each subdivided into a number of sections, and several lesser departments.

It is proposed here only to discuss the main planning requirements of offices for a Borough Council, as being broadly typical for the average local authority headquarters. As will be appreciated from the above, the requirements of other types of authority must be subject to detailed examination of each individual case.

The council suite comprises the council chamber, with provision for the press and a gallery for the public having separate access apart from that required for members and officials, the Mayor's parlour with lavatory, members' rooms with cloakrooms and lavatories for both sexes and two or more committee rooms. In addition to these main rooms, a reception room may be needed.

The main departments are usually those of the town clerk, the treasurer, the engineer and surveyor, and the medical officer of health; among other departments are included weights and measures, water, parks, registrar, etc.

Fig. 1 illustrates diagrammatically main relationships of parts. The treasurer's department is usually the largest in floor area, and can well have a separate entrance for the public for payment of rates; it is therefore generally placed on the ground floor.

The council suite is generally placed on the first floor, together with the town clerk's department, to which the public does not go in large numbers. The surveyor's and engineer's department and the architect's and planning departments have only a few public visitors; therefore, since they also require good north light and, if possible, top light for drawing offices, are usually placed on an upper floor. The public health department, especially when it has clinics attached, should have easy access for the public. The education department which occurs in County and County Borough offices only, may be placed anywhere in the building. The public does not need frequent access to it. The weights and measures department should be placed, if possible, on the ground floor, where easy access may be provided for deliveries by vehicles.

A smaller department office required is for the parks and gardens of the borough. This is an administrative office, the depots for supplies, etc., being generally elsewhere. It can be anywhere within the building.

OFFICES, ENTRANCES, STAIRCASES

The position of the service entrance is dependent upon the surroundings and shape of each site and the number of stories built upon it. It is, however, most satisfactory if all deliveries such as fuel and stationery, as well as the collection and removal of refuse, all take place near the same point of the plan, preferably in an enclosed yard.

### Entrances

Generally there is one main entrance leading to all departments and particularly to the council suite. It should be of importance, as it is used on occasions for ceremonial purposes; it should be approached by ample ways for vehicles, and temporary parking space for cars should be provided near to it.

The entrance hall should be large and spacious, with the access to the council suite prominently placed. Near the entrance should be provision for porters and telephones and from the entrance hall ample ways to vertical circulations to upper floors. The main entrance, particularly in smaller schemes, is often used for public access to the rates office.

Secondary entrances are required for easy access for the public to certain departments, for staff use and service deliveries. Secondary entrances, however, should be kept to the minimum for satisfactory circulation and must not increase unduly the necessary control by porters; secondary entrances are specially useful for public and staff access to the building when the main entrance is being used for an important function, and also serve for escape purposes from upper floors. Secondary vertical communications should be grouped with secondary entrances, and their positions should be such as to provide rapid communication between various departments.

### Main Entrance

Fig. 2 diagrammatically illustrates the layout for a main entrance. The access to the reception and council rooms, although carrying only a small proportion of the number of persons entering the building. should be handled as the most important circulation due to its ceremonial use.

The lifts in the main entrance are used to serve all floors, both for offices and the council suite.

In smaller municipal office buildings the porter also answers general inquiries and directs visitors to various rooms; but in larger schemes a separate inquiry office is generally necessary, in addition to the porter's room, which in such cases may be quite small; in either case telephonic communication is required to all departments from the entrance and the exchange room is well placed if near the main entrance.

### Main Staircase

The main staircase of necessity should be of important character up to the floor on which the council suite is placed, but may stop at that level and floors above be approached by smaller staircases. It should have adequate daylight and be not less than 5ft. wide. In smaller buildings it is often more economical to place the staircase hall on a main axis and the staircase at one side of such a hall. (*See* Fig. 3 A.)

Staircases are better if placed within a separate staircase hall, as shown in Diagram A, rather than at the entrance itself, as in Diagram B of Fig. 3, as there is less tendency for the entrance to become congested. The scheme shown in Diagram B is more economical in space than that in Diagram A and applicable to small buildings on congested sites. The main staircase should be obvious and accessible immediately on entering the building. A further planning point for the main staircase is its relation to main circulation corridors on various floors; it is better to place the main corridor, if possible, between the staircase and the entrance to avoid congestion and crossing of the staircase circulation by visitors to the ground floor departments.

### Secondary Staircases

Secondary staircases should be continuous from basement through all floors and of fireproof construction to serve as escape staircases. These staircases need not be elaborate in finish or decoration, but should have good daylight and ventilation, and not be less than 4ft. wide. (*See* Fig. 4 A.)

It is often better if a staircase is placed at right angles to the corridor, as shown in Diagram B; this permits the placing of staircases in re-entrant angles of buildings and leads to easier fenestration layout.

### Corridors

Corridors communicating with the council suite and similar important rooms should not be less than 7ft. wide, and are frequently more. Ordinary corridors serving office portions of the building should be from 5ft. to 7ft. wide. The height of corridors should not be less than 8ft. 6in., but need not be as high as the adjoining rooms, the upper parts being used for ducts and similar purposes.

# Municipal Buildings

## OFFICES, ENTRANCES, STAIRCASES

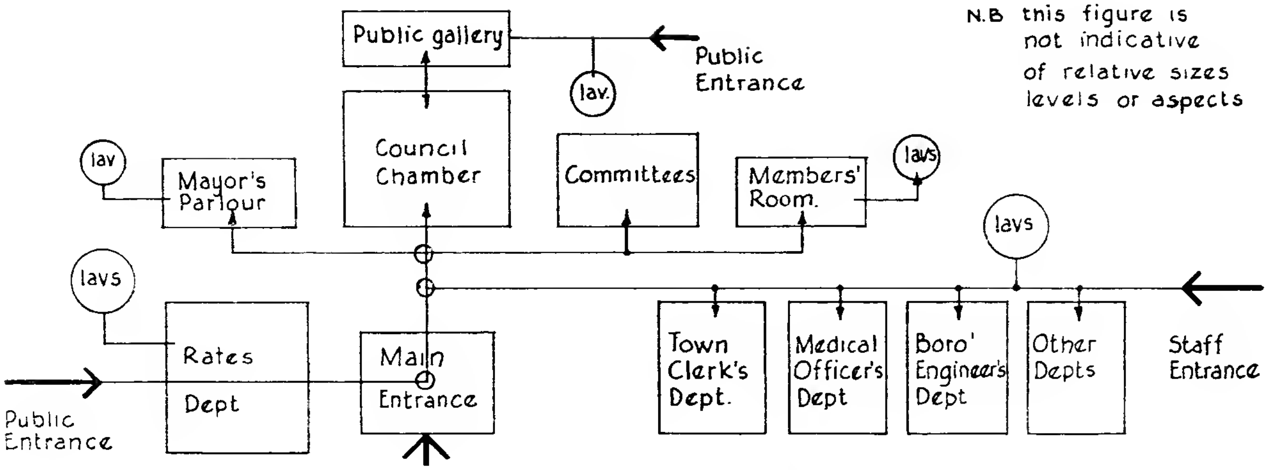



Fig. 1 General analysis diagram: Borough Council offices

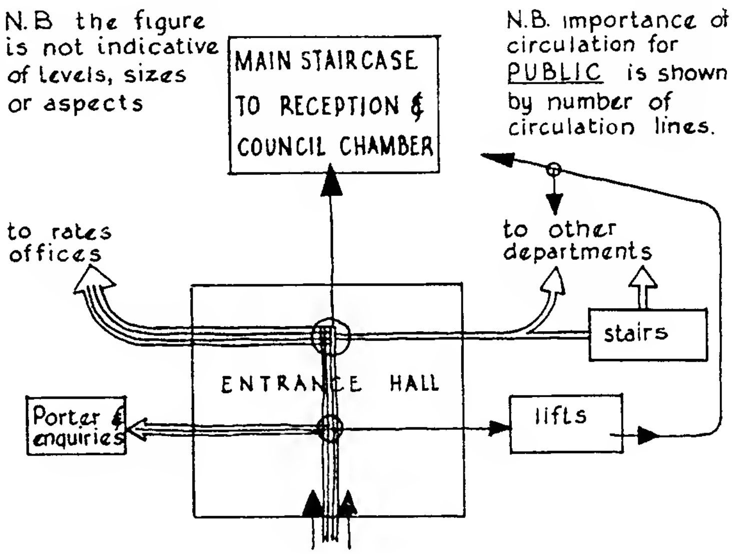



Fig. 2 Main entrance analysis

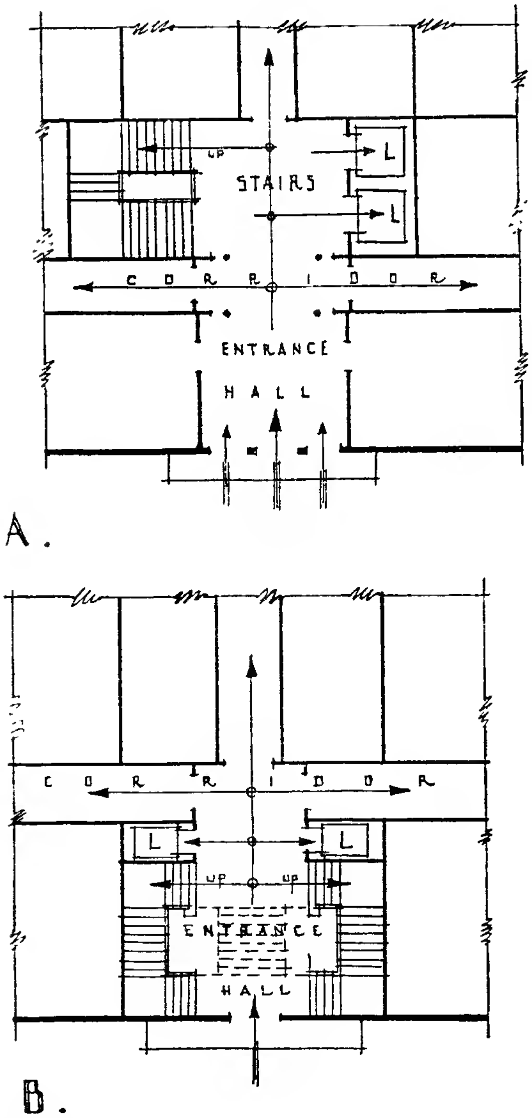



Fig. 3 The main staircase

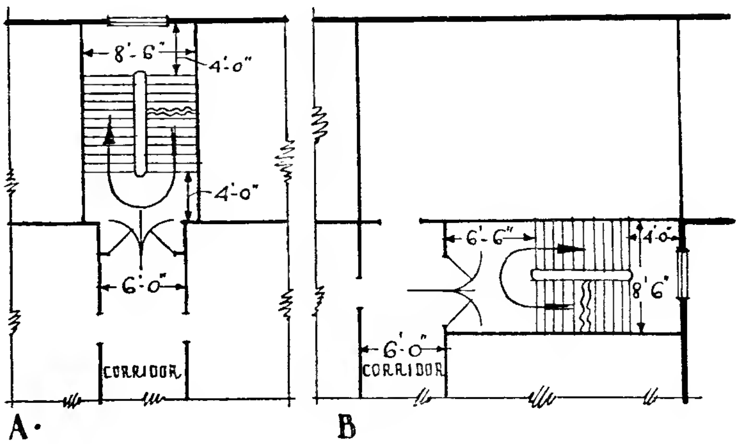



Fig. 4 Minor staircases

**Council Chamber**

The council chamber is architecturally the most important room in a municipal building. It is usually placed on the first floor and should be given a quiet position away from traffic noises. To overcome problems of noise transmitted through windows, council chambers may be top lighted, but this affects planning considerably, since it cannot be built over on any higher floors.

The council chamber has to provide accommodation for the mayor, deputy mayor, aldermen, a place for clerks and other officials, the ordinary members of the council, and for press and public. It is best entered by at least two doors from a members' lobby, virtually an ante-room, often in the form of a large recess off the main circulation and not necessarily cut off from it to form a separate room.

Adjoining the members' lobby are placed the members' rooms, of which two are essential, as in most councils there are women members; to each members' room should be attached cloakroom and lavatory accommodation.

The placing of seating is a primary factor in planning the council chamber. Fig. 5 illustrates broadly three different ways the necessary accommodation may be arranged. The first decision to be reached is placing the mayor in relation to the entrance doors to the chamber. In the main, two alternatives are possible as illustrated in Diagrams A and C, as compared with B; in the former the mayor has to walk the length of the room on entering, but less trouble is created by the coming and going of members, officials and press during a meeting: also in A and C the doors are in full view of the mayor when seated. Whereas in B members and others passing in and out may be disturbing.

These alternative layouts affect the placing of press and public accommodation, which may be in various positions as shown by the diagrams; in Type A the public is placed in a gallery over the members' lobby, which is approached by a staircase adjoining the main circulation and a secondary escape may be provided into a corridor on the floor over; the press are placed in the chamber itself near the doors on the council room floor level, with easy and rapid access to the members' lobby; Type A is economical in floor area and approaches. In Type B, in order that the public shall face the mayor's chair, the gallery has to be placed away from the remainder of the building, thus necessitating additional construction, particularly of staircases. It is also disadvantageous to have the press crossing the chamber to obtain access to the members' lobby during the progress of meetings. Type C is somewhat similar to Type A, except that public and press galleries are placed on either side of the chamber, which may, unless special care is taken, be detrimental to good acoustics. The ideal position for the press is undoubtedly near the centre of the central well of the chamber, but this position is generally disapproved of by local authorities, as it is disturbing to have the press passing through the seating to the lobbies, etc. Galleries for public or press should have at least 10ft. clear space between the general floor level of the chamber and their underside. It is important that the public is not in too close proximity to the members and for that reason seating for the public is not desirable on or close to the floor level of the chamber, as might be easily arranged in a plan on the lines of Type C.

When the position and general shape of the council chamber have been decided, certain details must receive consideration in the layout of the room. It is usual to step the seats for the councillors towards the centre of the room, an arrangement giving a clear space in the centre at a lower level than the surrounding parts of the floor. Around this well are placed the seats on the one side and a dais with desk and seats for mayor, deputy mayor and town clerk on the other. In large or medium-sized chambers the dais floor will be at the same level as the floor surrounding the general seating. In small chambers, however, the dais may have to be raised a step or two as the number of tiers of seats for councillors would be insufficient to raise the dais to an appreciable extent. Ample space should be left between the walls of the chamber and seating for members.

Tables and seating for officials are required and usually placed in the middle of the well of the chamber within easy hearing and sight of all proceedings.

It has become unusual to separate aldermen from the ordinary members unless the council is very large, though it is general to locate their seats in the front rows. Not more than six seats should be placed in a continuous row, and preferably only four seats. That is to say, no seat should be more than two or three seats from a gangway. Gangways and seating space should be ample, as it is necessary to ensure that members may rise and leave the council chamber without disturbing the meeting unduly. The horseshoe or semicircular type of layout is most common practice, and several variations of this form are shown in Fig. 6. Diagram E, however, is an alternative form sometimes adopted, in which benches are placed on opposite sides of a central well. This arrangement has certain objections in that it divides a council into two parties and this may not prove acceptable in many cases. In addition, such a plan may incline members to address each other across the room and not the chair.

Fig. 7 shows typical council seating based on an average of recent chambers. About 4ft. should be allowed between seats from back to back and at least 2ft. 3in. should be the minimum seat width from centre to centre of arms, which are usually provided. A desk or flap is usually fixed to the back of seats of the row in front and may well be sloped slightly. This writing slab should be wide enough to take foolscap paper, and should not be too high, 2ft. 4½in. being about the right height; the provision of ample knee-room is required, and this should be carefully watched where shelves or drawers form part of the desk fitting. As much space as possible should be provided between the front of seats and the desk or writing slab; this is essential for easy entrance or exit. The floor levels are usually arranged to drop about 6in. for each row of seats, but this may be increased up to a maximum of 1ft. 2in., or two 7in. steps per row of seats. Fixed desks with movable armchairs are used as an alternative to fixed seating. This arrangement allows room at the back of the chairs for exit, the space between chairs being about 9in. to allow for any movement essential for entry and exit. The platform table for the mayor, deputy mayor and town clerk is placed on the dais and should be fixed and of ample length, as it is often necessary to place large volumes, minute books, records, etc., upon it.

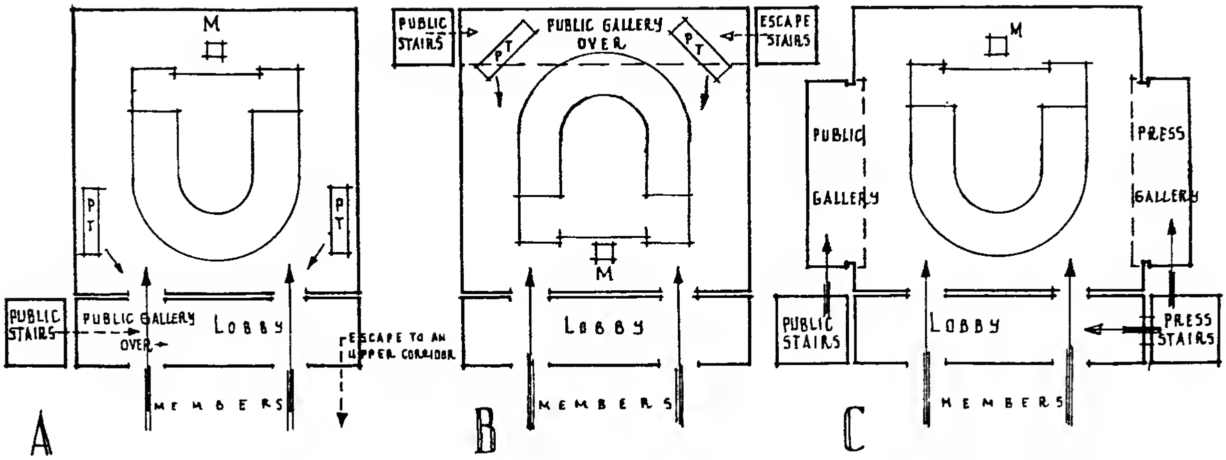



Fig. 5 The Council Chamber and its parts

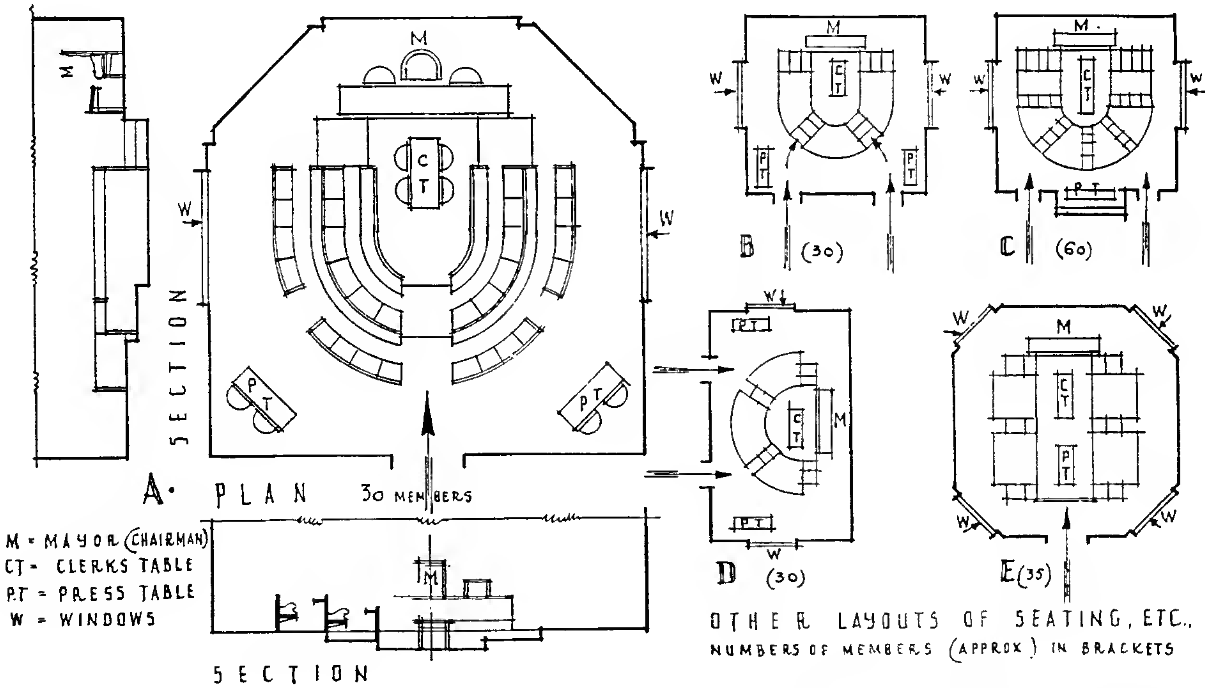
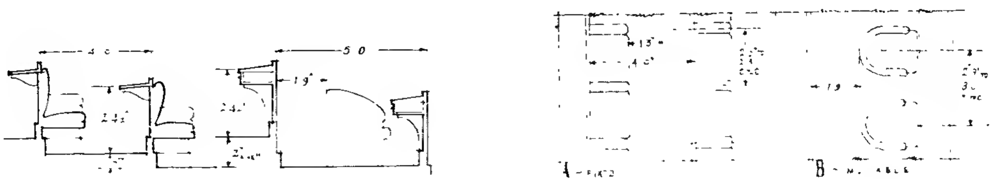



Fig. 6 Council Chamber seating: layouts



SECTIONS

PLANS

Fig. 7 Council Chamber seating: dimensions

**Position of Entrance Doors**

The position of entrance doors to the council chamber should be carefully studied. It will be seen from Fig. 6, Diagram A, that only one door has been provided and thought necessary for the chamber, in this case a small one.

In Diagrams B, C and D, two doors have been provided, and such an arrangement provides the easiest access to the gangways as here planned and allows for lobby voting if required.

The windows of a council chamber should be in such a position that light will not shinc into the eyes of the chairman and, on the other hand, the members should not be made to look towards windows when addressing the chair. It is seen, therefore, as in Fig. 6, that windows are usually best placed on side walls. This is difficult in the type shown in Diagram E, where the best position is suggested to be in the angles of the room. It is often wise to provide windows for council chambers, even though the room may be already well lit from a top light; this is suggested to overcome any feeling of oppression which may be caused by the lack of windows in a room which is used for long periods at a time. Artificial light should, if possible, be from some general source flooding the room and if skylights are used, indirect or semi-indirect lighting may well be arranged behind laylights. The switches for such lighting are sometimes arranged to be operated by dimmer controls so that the lights may be switched on gradually as daylight diminishes.

Local lighting for each councillor's place and for dais seats and clerks' table is sometimes provided in large types of council chamber, but it should, in all cases, be kept well hidden and well concentrated on desk or table.

Furnishings can assist the general shape of a council chamber to obtain the best results acoustically. It may be that only a small number of members are present at a given time and to assist acoustics it is usual, in fact necessary, to provide carpeting over the greater part of the floor area.

Among primary acoustic considerations is the position in relation to external noise; a quiet internal position is best; but if essential to abut on to a street, windows should not in any circumstances be provided on that side.

Council chambers must have good acoustics both when full and when only a few members are present; speeches may be made from any seat in the room and must be heard clearly in all other seats, including, in many cases, seats placed behind the speaker. To satisfy these special requirements, the chamber must be carefully designed both in plan and section.

Fig. 8 illustrates five good typical plan shapes for council chambers of varying size. One problem needing special thought arises from the large volume of the room compared with the number of persons in it, especially when calculated for a quorum only, and additional absorbents are required to reduce reverberation; but the volume should be reduced as much as reasonable, having regard to general design (Fig. 9). Ceilings, therefore, should be placed not more than 30ft. above the speakers, flat for at least 75 per cent of their area, and be of a reflecting material; the remaining portions of the ceiling may be splayed or coved to reflect sound towards the centre of the room and towards listeners placed behind any speaker. The upper parts of walls should be soft or absorbent plaster, particularly opposite the mayor's chair, while the lower walls, for a height of 8ft. to 10ft. should be a reflecting surface such as polished wood.

The placing of press tables so that the reporters may have perfect hearing is also important; this is generally difficult to achieve if press accommodation is in galleries.

Public galleries should not be set in deep recesses, but should be wide and shallow without obstructions such as columns.

Special care should be taken in regard to mechanical equipment, such as lifts, ventilation ducts and fans, in order not to cause noise in the council chamber.

Windows, when used, are best if of heavy metal construction, in the form of casements, glazed with ¼in. plate-glass in small squares, or double windows, in wood or metal, isolated from each other, with as large an air space between the two windows as possible.

**Committee Rooms**

Fig. 10 shows typical seating arrangements. If committees are arranged on both sides of tables, the minimum practical width of the room is about 15ft: if arranged on one side of the tables, the room can be narrower but will of necessity cover a larger area for the same number of members. The widths of tables are also shown on Fig. 10. Tables should allow 2ft. 6in. run per person. The furniture is, of course, movable.

In many cases tables are made in sections for easy handling and for possible adjustment for larger or smaller committees. The chairman should be placed with his back to the light and facing doors, if this is at all possible.

Committee rooms should generally be arranged to be inter-communicating in such a way that all or some of the rooms can be arranged as a large room on occasion; one of the rooms is best planned for use as a possible general reception room for civic occasions.

Committee rooms should be in quiet positions; if, however, the rooms have to overlook busy streets, double windows are essential. Floors should be carpeted over the whole area, both to produce an absorbent and to reduce the noise of persons walking about. The walls, above a resonant dado of wood 4ft. 6in. minimum height, should be covered with absorbent materials. Ceilings should have reflecting surfaces and be either flat or curved provided that the centre of the curve is well below floor level. Hard-top tables act as reflectors.

A problem in connection with committee rooms may arise from the necessity for having movable dividing screens or folding or sliding doors between two or more of the rooms. The most satisfactory method of reducing sound transmission between the rooms is to provide heavy wooden folding or sliding doors, with the addition of a thick curtain on at least one side of the doors, preferably on both. (*See also* Part 1: Furniture.)

**Council Suite**

The council chamber and committee rooms, the rooms of major importance, have now been considered; the relationship of the remaining rooms to each other and to the main rooms remains to be discussed.

Fig. 11 illustrates in diagrammatic form the chief circulations, etc. within the suite.

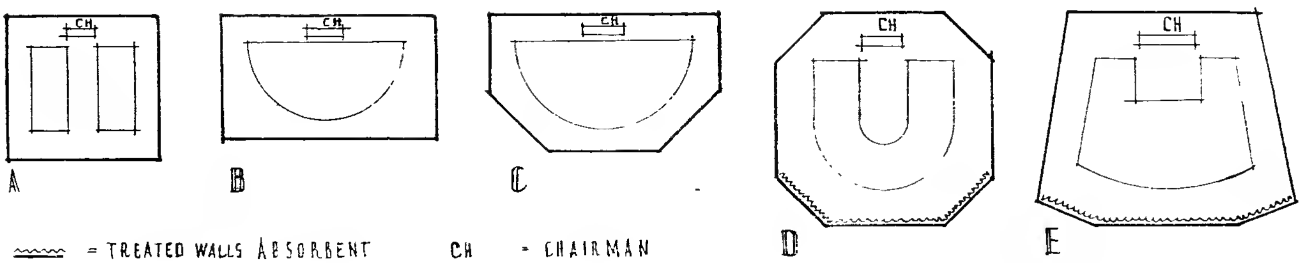



Fig. 8 Council Chamber acoustics

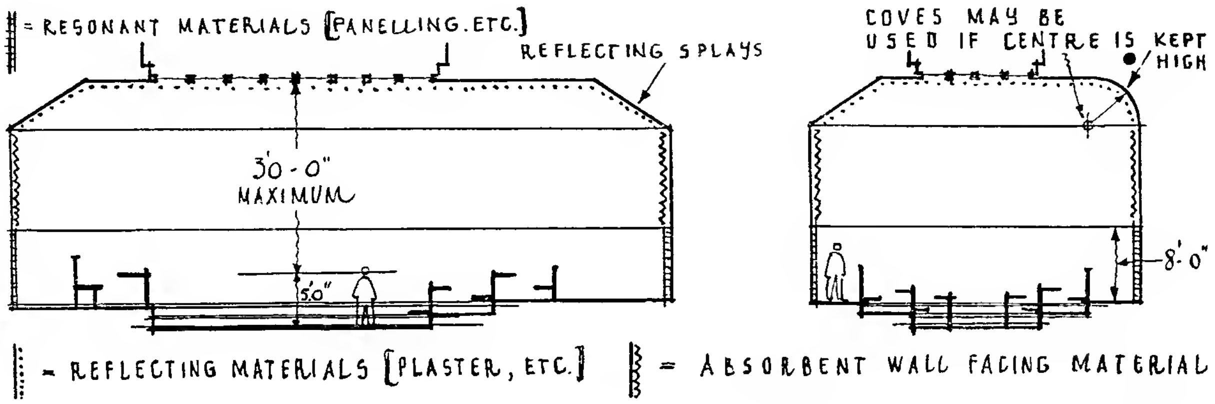



Fig. 9 Council Chamber acoustics

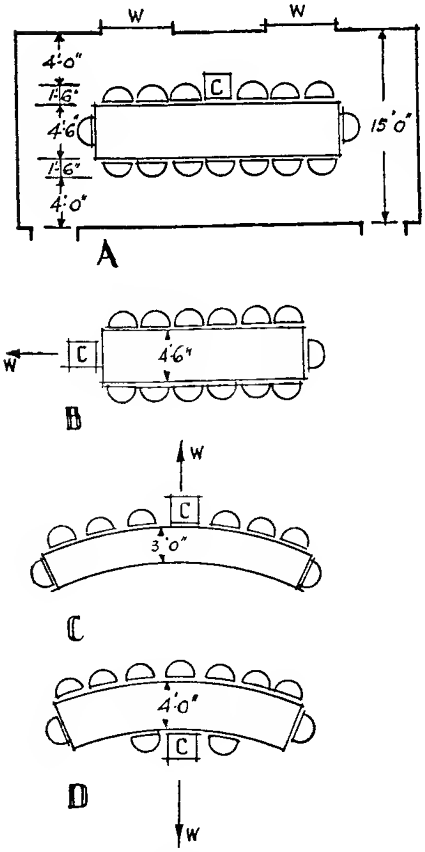



Fig. 10 Committee room seating

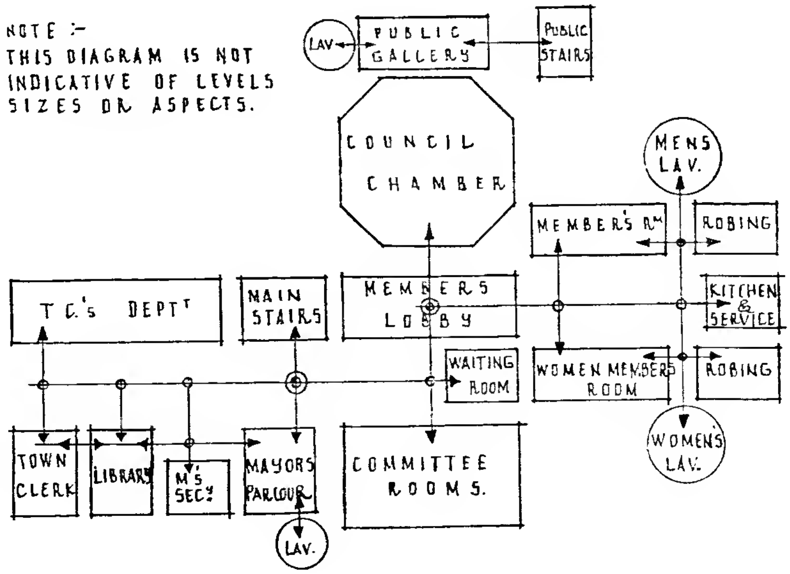



Fig. 11 Analysis of Council suite

PUBLIC GALLERY, MAYOR'S PARLOUR, SHERIFF'S ROOM, MEMBERS' ROOM, WAITING ROOM, LIBRARY, RECEPTION ROOM, BALCONY, DEPARTMENTAL OFFICE ACCOMMODATION

### Public Gallery

The public gallery should have separate access either from the main entrance or from a special entrance and an alternative means of escape is desirable; this becomes essential when the seating accommodation is over about 100 seats or is at all isolated. Seats should face the chair and be arranged, if possible, in two or three rows only; this is not usually difficult, as numbers are generally under 100. Seats should allow a reasonably good view of the whole chamber and be sloped or stepped accordingly. Seats are generally fixed (to avoid noise), allowing about 1ft. 8in. run per person and spaced 2ft. 8in. apart, back to back. It is desirable to have not more than ten seats in a row between gangways. A space about 5ft. wide is desirable behind the back row of seats, for circulation and for attendants to supervise the gallery.

### Mayor's Parlour

This room is used as a combined reception room and a private office for the mayor, and should be planned and furnished accordingly. It should be near the council chamber, committee rooms and town clerk's office, more particularly the last two. A private lavatory is usually attached to the room with a lobby or cloakroom for robing, or at least a large cupboard for the storage of robes, etc. In larger towns or cities the Mayor or Lord Mayor has a small room adjoining for a private secretary.

### Sheriff's Room

In City Halls where there are sheriffs, it is necessary to provide a room or rooms for their use; it should be near the mayor's parlour.

### Members' Rooms

These are used in common by all members of the council. A separate suite is usually provided for lady members. The rooms should adjoin the members' lobby or ante-room to the council chamber, although the greatest use may be in connection with committee rooms. The robing or cloak rooms should adjoin the members' rooms and generally consist of ample space for lockers or wardrobes; often these are movable rather than built-in fixtures.

The cloakrooms, lavatories and members' rooms should be arranged *en suite* for each sex as illustrated in Fig. 12. In deciding the number of W.C.s, it is doubtful if lady members of any council would be more than one-third of the total number of members (at any rate, at the present time), and a general provision of one W.C. for every five lady members, with a minimum of two and one W.C. with one urinal for every ten male members is usually found to be adequate.

Lavatory basins should be provided in about the same ratio.

### Waiting Room

A waiting or interview room for the use of small deputations attending council or committee meetings is sometimes required. It is used more particularly in connection with the committee rooms.

### Kitchen

A small service kitchen is usually required in connection with the council suite. It does not, as a rule, need to be large or elaborately equipped, as it is mainly used for serving tea, coffee, and light refreshments to council and committees, these often being served in the members' rooms. A room of about 100sq. ft. to 150sq. ft. is generally adequate, fitted with sink, boiling rings or urns and shelving for the storage of china, etc. It may be placed in an unimportant position in fairly close relation to the members' and committee rooms.

### Library

A small library for the keeping of minutes, by-laws, acts of parliament, etc., is sometimes needed in larger municipal buildings; it should be easy of access for members, but more particularly for the mayor and town clerk, part of whose department uses it for reference purposes. A room about 200sq. ft. to 250sq. ft. is usually sufficient.

### Reception Room

Many councils require a reception room in conjunction with the council suite, whether or not an assembly hall is provided as part of a scheme. Where there is not an assembly hall, the reception room is frequently placed at the head of the main staircase and *en suite* with the committee rooms, but when there is an assembly hall, the reception room is often placed so as to form linked-approach to the hall from the council suite for use on important occasions.

### Balcony

A balcony placed on the main façade or overlooking a space in which crowds may assemble is a general requirement in all municipal buildings; from it public announcements are made on occasions such as elections. The balcony should be placed on the first-floor level, approached from either a committee room, the reception room, or a staircase landing. It should be at least 3ft. wide and long enough to accommodate at least ten or twelve persons comfortably.

### Departmental Office Accommodation

The rooms of various separate departments must be planned to produce good and efficient office accommodation and to ease administrative circulations as much as possible.

Rooms should not have a greater depth from window walls than 20ft., and probably not more than 18ft. to give adequate working light for the whole area and to provide rooms of reasonable shape. Office corridors should be not less than 5ft., and preferably 6ft. wide, the latter permitting the introduction of wide double doors.

The general layout of all departments should be based on that shown in Fig. 13. Rooms requiring access by the public should be placed in the positions most accessible to entrances and staircases; rooms for heads and assistant-heads of departments should be placed away from rooms to which the public goes; also private secretaries' rooms, when needed, should adjoin, or be planned *en suite* with the rooms of heads of departments.

The number and size of departments depends entirely on the type of local authority (County, County Borough, Urban or Rural District) and the size of its area.

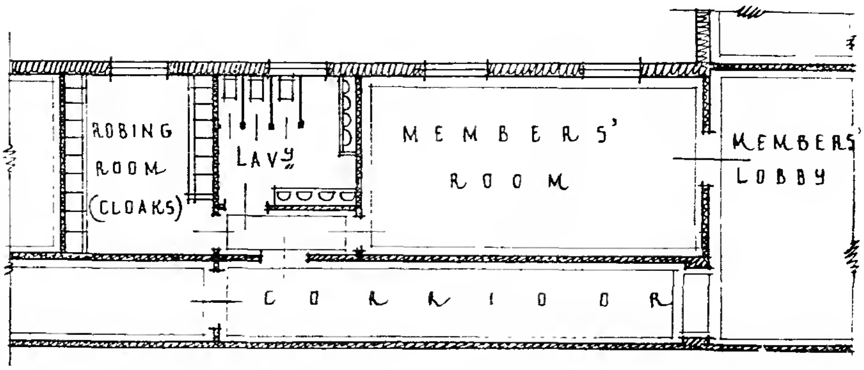



Fig. 12 A typieal Council members' suite

### Town Clerk's Department

This department is generally placed on the first floor in order to adjoin the council suite, and the town clerk's private office should be placed near the mayor's parlour or office; otherwise the department is laid out in the usual way. In addition to normal departmental accommodation, it is usual to have a special office for the preparation of voters' lists (Electoral Registration) near the department.

### Treasurer's Department

The treasurer's or accountant's department is a section of the office accommodation which requires early and careful consideration, as it is one of the largest departments, and because the public needs access to it in considerable numbers for the payment of rates, charges for licences and charges due to municipal undertakings. Some supply undertakings are administered in separate offices, but more frequently, in recent years, their accounting offices have been amalgamated with the remainder of the municipal accounting for ease and economy of administration.

Of the rooms in the treasurer's department, the rates office is of major importance from the public point of view, as it is here that all the payments and inquiries with regard to payments are made. The room should be easily reached from the main entrance, or from a special and prominent separate entrance; in either case visitors to the building should be discouraged as much as possible from wandering into other departments, noisy traffic thus being confined to one part of the building. The rates office is generally similar to an ordinary banking hall, divided by a counter into parts, one for the public and the other for the clerks' working-space. Sometimes only a small room is provided, wide enough for the public space, and a counter with about 5ft. or 6ft. behind it (just sufficient for counter clerks to work), the remainder of the office space being either screened or completely cut off. Normally, however, little separation is made, and the public space and counter are arranged in a large room in which also work a part of the accountancy staff.

The room must be sufficient in area to provide for a counter to accommodate adequate clerks' desks and equipment, each of which requires 5ft. or 6ft. run. The room generally forms a fairly large proportion of the department and, owing to its size, frequently needs top—in addition to side—light for the proper daylighting of the central part; in the past, rates offices have often been placed on the ground floor under the council chamber, but this position makes top light impossible, and its omission can well limit the span of the room to a figure below that desired for the accommodation above.

Fig. 14 illustrates four typical plans of rates offices, two—A and D—for small schemes and two—B and C—for large buildings. The counters in both the small examples are arranged so that the public faces the light and the clerks therefore have it behind them. Diagrams B and C show alternative placings of the public: in B it is arranged in the centre, so that working space for clerks either in the open hall or within screened compartments is available on all three sides in the space nearest to windows. Clerks should be close to the counter clerks with whom they have to work. The counter plan in Type C is satisfactory for large schemes where a great length of counter space is needed, but, owing to the span required for a room providing at least 10ft. widths in the two public spaces and adequate working width for the clerks the layout is not, as a rule, economical for medium-sized schemes. The public has rather more circulation space in Type C, but any advantages from this are counterbalanced by the less convenient layout and lighting of the clerks' space.

The public circulation space should not, except in very small offices, be less than 10ft. wide and never less than 8ft.

Counters at which clerks work are generally about 3ft. wide and about 3ft. 4in. high and equipped with grilles between clerks and public, so placed as to permit writing facilities on the public side. Fig. 15 illustrates the more important features of normal counter-desk fittings.

### Treasurer's Strong Rooms, etc.

At least two strong rooms are needed in connection with the treasurer's department, one for cash and the other for storage of books and papers. These rooms are either placed adjoining the rates office and on the same floor, or in the basement and connected by means of a book lift to the department. Strong rooms are not generally placed on outside walls, but proper ventilation must be provided. Special care should be taken when planning entrances to strong rooms, as doors open outwards and are generally wide enough to provide at least a 3ft. clear opening for the passage of book trolleys; passageways must allow for door clearance, or approach lobbies should be planned (see Fig. 16). The walls of internal strong rooms are at least 1ft. 6in. thick if in brickwork, or 12in. if in reinforced concrete; in both cases reinforced

concrete ceilings and floors are now usual.

For the other rooms in the department there is very little in the way of special planning required; interview rooms may be required near the rates office, or the general clerks' office and are also certain to be needed in connection with the valuation section of the department. The valuation section of the treasurer's office is sometimes only a part of the large general clerks' space, but is often separate adjoining the rates office.

The deputy treasurer should be placed reasonably near both rates office and general office, which he will probably have to control; whereas the treasurer's office can be placed separately, as controlling the whole department. Some authorities, however, prefer to have heads of departments and their deputies adjoining one another.

In larger districts a room is usually allocated to district and/or professional auditors; this can be almost anywhere in the department.

With increasing mechanization of accounting, special rooms are required for sections of the work of a treasurer's department. Where the equipment consists only of power-driven invoicing or ledger machines or addressograph machines, the work may be done in normal office spaces, but the latter must be cut off from the public areas of the department and from all other rooms by adequate acoustic safeguards in addition to special treatments for the reduction of noise within the machine rooms.

In some larger authorities, however, mechanization has been extended to computing equipment based on punched cards and sorting machinery. Such installations require considerable space specially allocated with all necessary power supplies and, in some types, with special provision for complete artificial ventilation and humidity control. Where such methods form a major section of the work of the department the equipment is often rented and is maintained by the renting organization, who may keep permanent maintenance staff in attendance and will require workshop space for repairs and for the preparation of machinery change-overs.

In the foreseeable, and probably close, future such computing equipment will become, with extended electronic controls, even more mechanized and automatic in operation and will require specialized planning and structure which cannot be outlined or summarized shortly here.

Wherever special computing equipment is installed it should be planned on a ground or a basement floor as very firm structural floors which must be strong enough, exactly level and non-vibratory are required.

### Inquiry Rooms

Fig. 17 illustrates two methods of planning departmental inquiry rooms in conjunction with a waiting room and an interview room. Another common arrangement is to combine inquiry and waiting space and form it by partitioning off a part of the general office; the interview room may then either be approached through the general office, or be placed on the opposite side of the waiting space.

### Engineer's and Surveyor's Department

The general arrangement should follow lines suggested for the layout of other departments. The public needs access, in limited numbers, to a few rooms, mainly the departmental inquiry office, building inspector's office and any estate management office.

In many schemes the department is on the ground floor (or at least those rooms to which the public needs access) but it is more general in larger schemes to place the department on an upper floor. It is convenient to plan the building inspector's room adjoining the departmental inquiry and waiting rooms.

In addition to normal offices there are a few rooms requiring special consideration, such as drawing offices, which should have north light if possible, either by means of roof or side windows, the former being preferable, though not essential. A photo-printing room is usual, and may be placed in an unimportant position, preferably near the drawing office; this room does not need good daylight, but must have good ventilation, ample space for handling large sheets of paper, both on tables and in the sink and have one wall free for a drying rack. In large departments a special room, to which storage should be attached, is sometimes needed for testing sample materials. Large storage for plans and documents is usually needed, partially in the form of strong rooms, one of which, for the storage of plans, is frequently, in small districts, attached to the building inspector's room.

### Architect's Department

In many authorities there is a separate architect's department. Generally the accommodation is similar to that provided for the engineer. In smaller areas the architect may be accommodated with the engineer in order to share facilities such as general typing, drawing offices and photo-printing rooms, though filing and storage is usually kept separate.

### Planning Departments

County and County Borough Authorities require separate departmental accommodation generally similar to that provided for the engincer's department, for town planning work and administration.

### Public Health Department, Welfare, etc.

This department is sometimes planned in association with the main health centre and clinics, instead of forming part of the municipal offices. Provision must be made for the medical officer of health, his staff, sanitary inspectors, who also cover inspection of food, and offices for services such as ambulances, health visitors and home helps. The public need access to an enquiry office and, if the number of visitors is likely to be large, a separate entrance to serve the department may be desirable. A small laboratory is necessary near the medical officer's room and sometimes a second laboratory for the use of the sanitary inspectors; these laboratories are not generally equipped elaborately but they should be planned to be cool, well ventilated and well lighted.

### Education Department

This department is usually required only in County and County Boroughs. The department is, in the main,

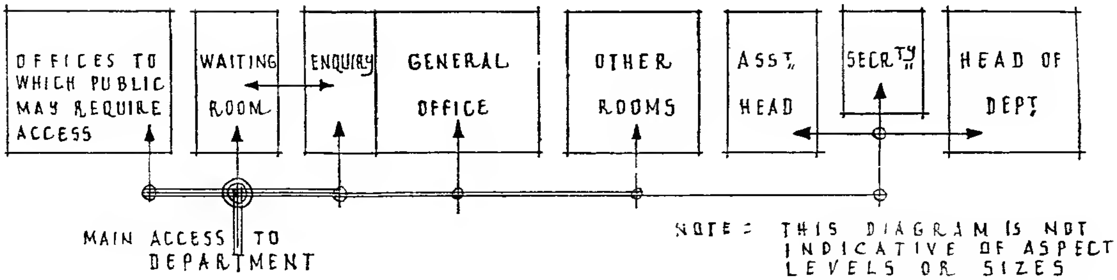



Fig. 13 Analysis of departmental planning

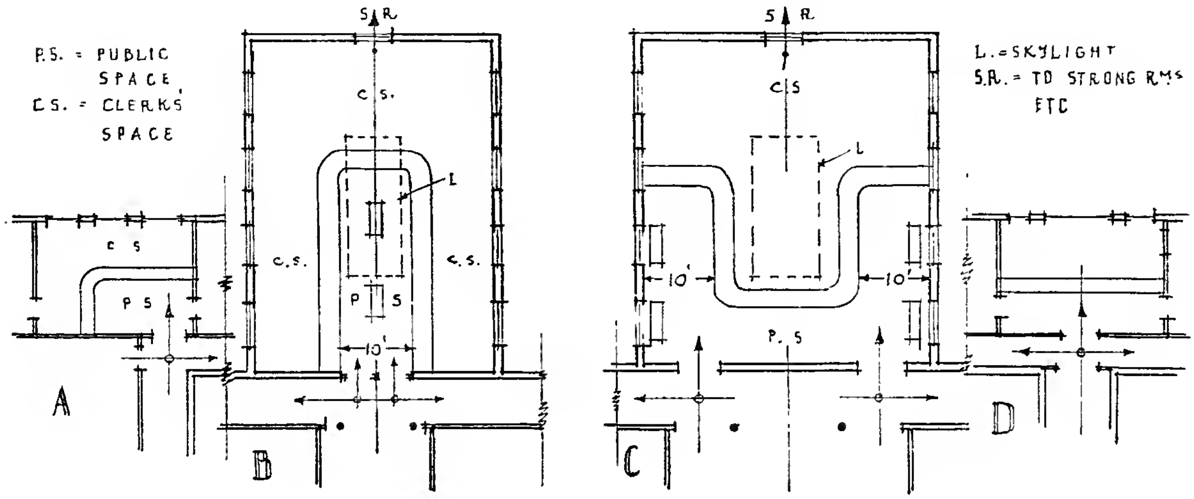



Fig. 14 Typical planning of main rates offices

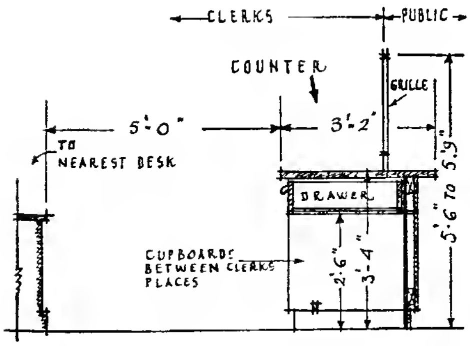



Fig. 15 Rates office

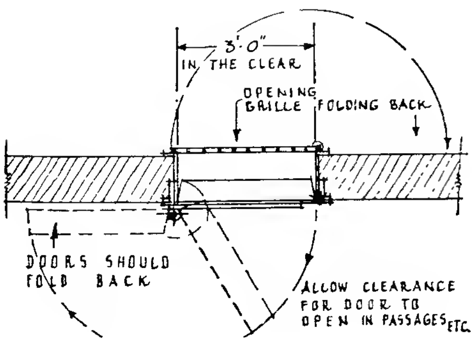



Fig. 16 Strong room doors

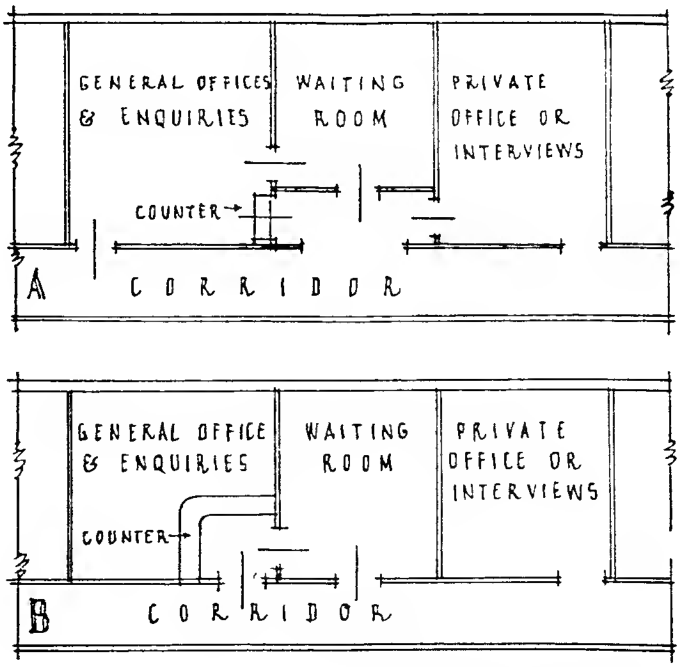



Fig. 17 Planning of departmental enquiry rooms

straightforward office planning and may be placed in any position in the building, though the public requires access to certain rooms, chiefly those of the chief officers and the school inspectors.

### Sundry Other Rooms

There are a number of other rooms which are sometimes required according to the particular district. These include weights and measures department, publicity and information bureaux (usually needed in seaside and health-resort towns); offices for management of waterways, parks, allotments, etc. These sundry departments or sub-departments are generally administrative and the offices should be planned as such.

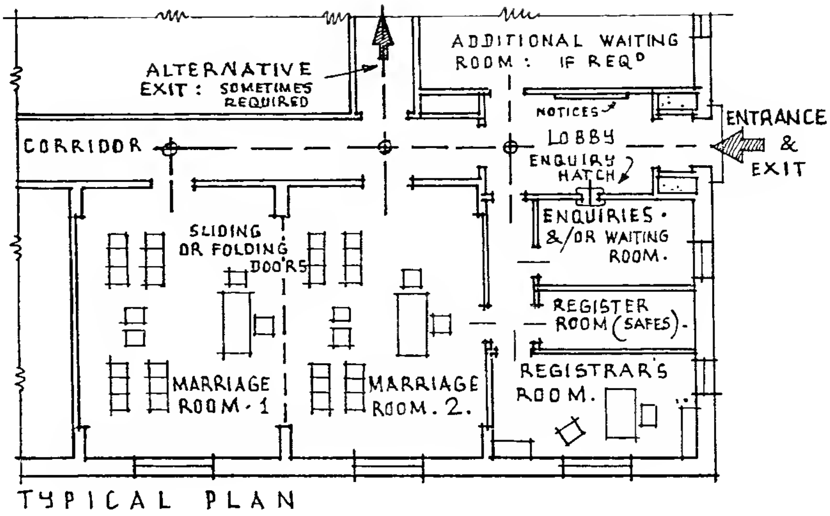



Fig. 18 Registrar's department: marriage rooms, etc.

### Registrar

Many districts provide accommodation at the municipal offices for the registrar of births, marriages and deaths.

The accommodation is most satisfactorily placed on the ground floor adjoining one of the minor entrances to which there is vehicular access as there is a continual flow of visitors and, for weddings, these may be numerous at one time. The registrar requires an office for himself, one or more offices for staff, a waiting room and fire-resisting store rooms; in large areas, however, the accommodation may need to be larger with the addition of marriage rooms; on occasion the marriage rooms may be in continual use, thus making heavy demands on waiting spaces.

Fig. 18 shows a suite of rooms allocated specially for weddings. It should be noted that they are planned close to an entrance from the street and comprise a general inquiry room, with a large waiting room adjoining if it is a busy office, a strong room for the registers, a private office for the registrar and a large room, capable of division into two rooms at busy times, for marriages. These rooms are tending to become more suitably decorated than has been the practice in the past.

It is important that privacy is provided in rooms in which information is given to the registrar especially in connection with births and deaths, and this part of the registrar's work is often dealt with in separate rooms with their own waiting spaces.

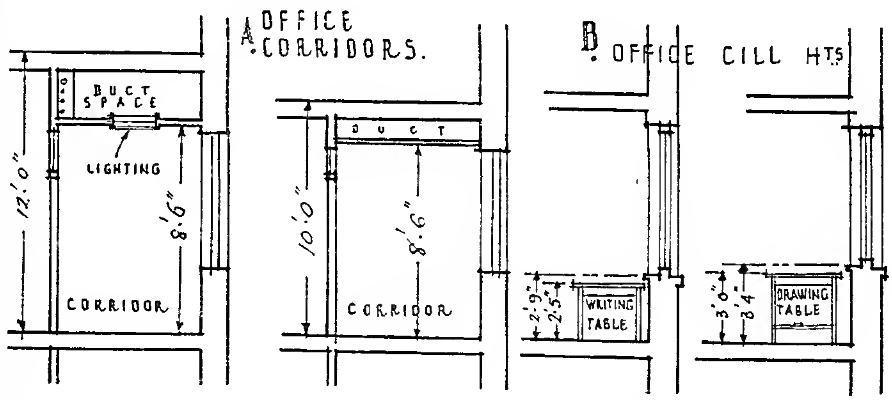



Fig. 19 Some sectional data

### General Office Considerations

There are a few important general matters to be carefully noted in regard to the office parts of municipal buildings. Floor heights for offices should not be less than 10ft. from floor to floor.

Sill heights of windows should be considered in relation to the use of the rooms; in the case of ordinary offices, sills should be at least 2ft. 9in. above the floor, or about 3ft. 1in. or 3ft. 2in. to the glass line, while in drawing offices sill heights should be at least 3ft. 3in. above the floor. Windows, particularly opening parts, should be as near the ceiling as possible to provide good ventilation and as much light as possible at the back of rooms (*see* Fig. 19).

In the past, few special precautions have been taken to reduce noise in rooms used for office purposes, but there are simple considerations worthy of note, such as the avoidance of hard plasters for walls and ceilings, special absorbents on ceilings and the upper parts of walls in rooms where machines such as typewriters and addressing machines are used. Floor coverings are also worth some thought, as materials such as thick linoleum, cork carpet, rubber, and some composition floors, are less noisy than boards or wood blocks, although possibly more expensive, either in first cost or upkeep.

### Corridors

Much disturbing noise emanates from corridors in office buildings for similar reasons to those outlined above for offices, more especially when fanlights are placed over doors and when over-light partitions and screens are used as the divisions between the rooms and the corridors; similar consideration should be paid to the choice of floor covering.

Corridors should be at least 8ft. high in the clear, at which level false ceilings may be placed in order to form ducts for ventilation, pipes and other services, as illustrated in Fig. 19; these ducts may be used both for ventilating the rooms themselves by an extract system or for the corridors, where rooms occur on both sides.

### Services

The provisions for sanitary accommodation, canteens, and services, such as heating, hot water and lifts, should be similar to those needed for any other large buildings and should follow the information given in the section on "Factory Buildings," page 302.

### Assembly Halls

Assembly halls attached to municipal buildings usually are designed for a variety of uses, such as dances, stage plays, public meetings, etc. In most cases it is desirable that the hall, even if connected to the offices should be capable of being let off separately and should, in all cases, be so planned that the office routine is not disturbed by any functions which may take place in it.

The main approaches should be separate from those to the offices, but a connection between the two types of building is generally required and frequently takes the form of a reception room so that the mayor and councillors may reach the hall by means of an easy and open circulation. The planning of this connection from council suite to the hall involves a decision as to whether it should be at the entrance or foyer end of the hall or at the platform end. On some occasions, such as political meetings, direct approach to the platform without passing through the hall is required, whereas on other occasions it is preferable that the mayor should enter from the foyer.

Assembly halls are generally controlled by regulations governing "places of public entertainment." In the L.C.C. area, and in many other licensing districts, these regulations give minimum seat sizes, gangway widths, number and size of exits and seating, while in most other districts similar regulations exist or are implied.

### Seating

As the hall may be used for varying purposes, a flat floor is desirable, with movable seating. The seating in any gallery, however, is generally fixed. The L.C.C. regulations give the minimum seat sizes with back and arms as 2ft. 4in. deep and not less than 1ft. 8in. wide, but where backs and arms are not provided the minimum sizes are 2ft. deep and 1ft. 6in. wide. A more ample standard would be 2ft. 6in. by 1ft. 10in. for tip-up seats. Chairs are occasionally used, battened together in lengths of not less than four chairs.

### Gangways

The L.C.C. regulations require seating gangways to be not less than 3ft. 6in. wide; it is generally wise to make them at least 4ft. The regulations require that seats should not be more than 10ft. from a gangway, which means, with the L.C.C. minimum seat, that not more than 12 seats can be placed in a row with a gangway at each end, or six seats where there is a gangway at one end only; the number of seats in a row may possibly be increased to thirteen and seven on the assumption that the 10ft. is measured from the gangway side of the seat to the gangway. If the space in front of seats exceeds the regulation width of 1ft., the distance from a gangway may be increased with more seats in each row. Fig. 20 illustrates the widths of halls as dictated by varying numbers of seats and positions of gangways based on L.C.C. minima. A layout without a central gangway is usually considered best; on the other hand, if a centre gangway is not provided, the mayor or distinguished visitors, if walking the length of the hall on important occasions, have to do so by way of a gangway not in the centre of the audience. The central gangway has some advantages on ceremonial occasions. Adequate space should be allowed between platform and the front row of seats; this should not be less than 5ft., but preferably more.

### Storage of Seats

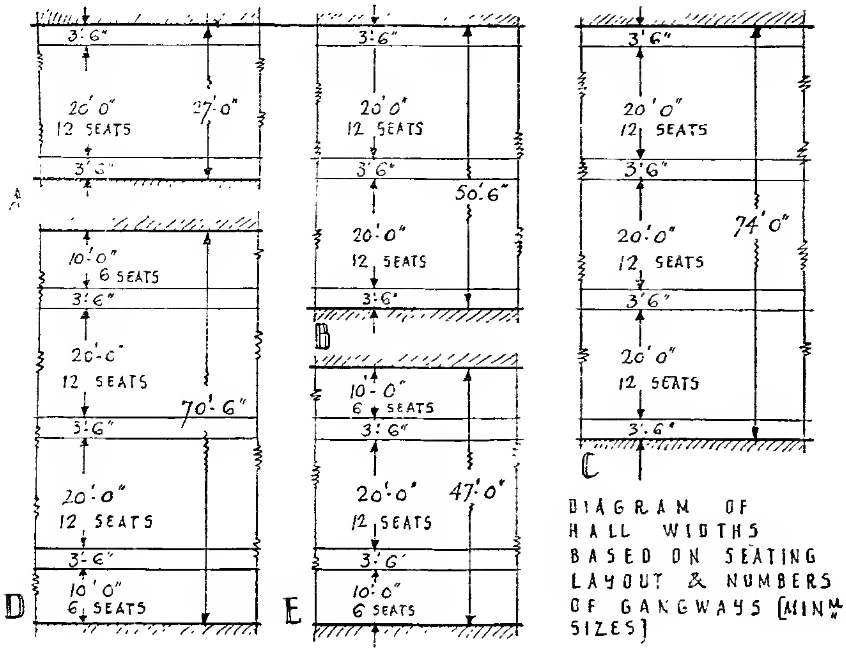
If seating is to be movable, proper storage must be provided in close proximity to the floor of the hall. Frequently, this storage can be arranged under the platform, with access doors in the riser, or face, of the platform.

### Galleries

Galleries must not have a greater slope than 35°, but lesser angles are more satisfactory especially in planning gangway steps. A minimum clear height of 10ft. is required at all points above and below the gallery. If a gangway is placed behind the back row of seats it should be at least 5ft. wide. Guard-rails not less than 3ft. 6in. high above the floor level must be provided on the balcony fronts, or as resters in front of gangway ends. Fire authorities prefer the direction of gallery exits to be on the same level as cross gangways or upwards towards the rear of the gallery, rather than downwards towards the stage.

Fig. 21 illustrates these points, based on a gallery angle of 30°. It will be noticed that when the angle increases intermediate steps between the various levels of the seating become necessary and the rise of steps becomes more and more unwieldy as the angle approaches the maximum.

Fig. 20 Hall widths



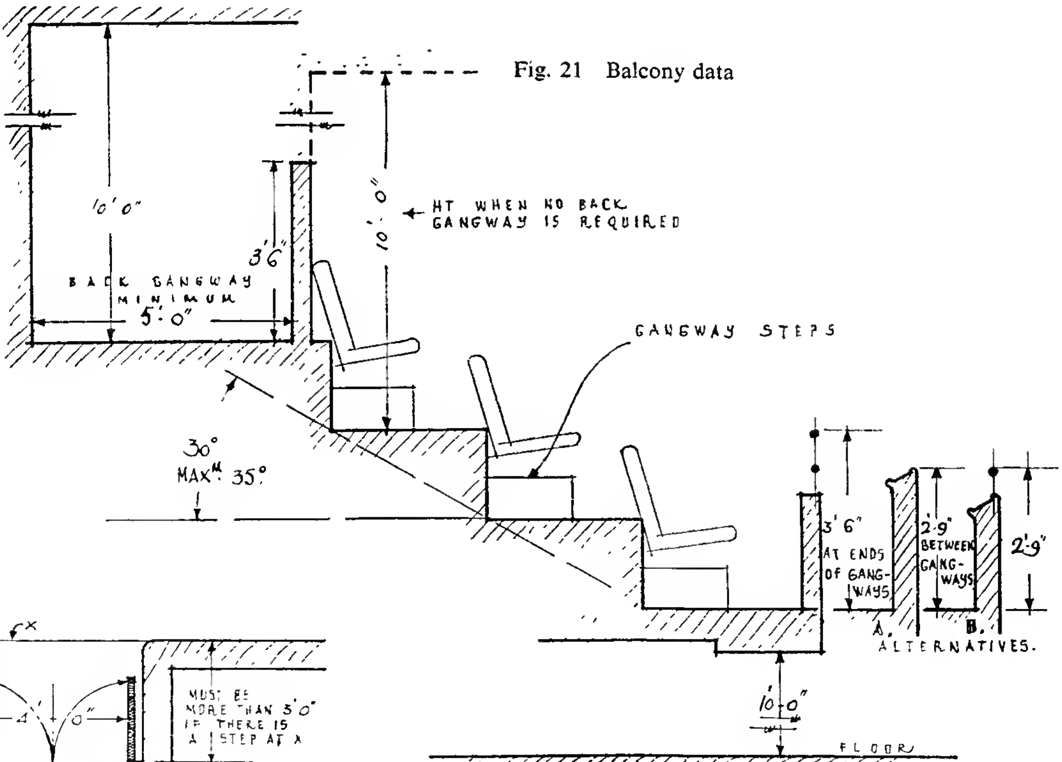




Fig. 21 Balcony data

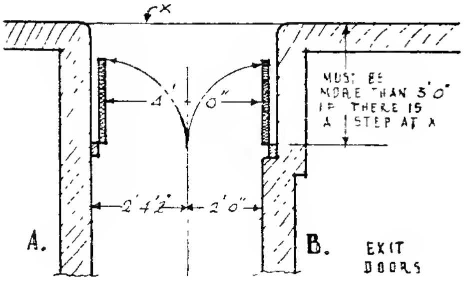



Fig. 22 Exit doors

**Exits**

Requirements vary among administrative authorities but usually each tier or floor of a hall must have at least two separate exits if not more than 500 persons are to be accommodated, with an additional exit for every 250 or part of 250 persons above 500. The alternative exits from each part must deliver into separate streets or ways; one of the exits may be the entrance to the hall, but the others must be alternatives leading as directly as possible to the external air by means of corridors, staircases and doors at least 4ft. in width when there is accommodation for less than 300 persons and at least 5ft. when there is more. The corridors, when finished, must be the clear widths required by the regulations, and be constructed of fire-resisting materials. It is preferable to make use of ramps, instead of steps, so long as the gradient does not exceed 1 in 10, but, if steps are used, a flat space 5ft. wide must precede the start of any staircase and a similar space is desirable at doorways. No projections exceeding 2in. are usually permitted in corridors or passages.

**Staircases**

These should be the same width as corridors. Winders generally are not permitted; flights should have at least three steps and not more than sixteen steps each, nor should more than two flights be used without a turn and, if two flights are used without a turn, not more than twelve steps should be used in each flight. Staircases must be of fire-resisting construction. Treads should be at least 11in. wide, and risers no more than 6in. Treads and risers must be the same size in each and every flight used by the public. Continuous handrails should be fixed on each side of all steps and landings at a height of 2ft. 9in. above the steps or landings, and at returns, and the newel wall should be chased at its ends, to let the handrail turn without projecting into landing spaces. All landings must be at least the width of the flights of stairs.

**Doors**

Doors should be made to open outwards, but must be so hung as not to obstruct, when open, any gangway, passage, staircase, or landing. If doors are to be used for entrance as well as exit, at least one of the leaves should open both ways.

Doors must not open on to steps without at least a 3ft. landing as shown in Fig. 22. Revolving doors are not allowed.

**Platform**

Suitable sizes for platforms are not easy to determine, owing to the various uses to which they may be put. The size is often dependent on orchestral and choral requirements, which are 10sq. ft. and 7sq. ft. per person respectively. Platforms should not be less than 15ft. deep, but this is too small for most theatrical performances, and 20ft. to 25ft. should be provided. Platform widths are usually governed by that of the hall, less the width of any circulations which may be planned on either side of the platform.

The general requirements behind the platform are a green room, orchestra room and dressing-rooms for both sexes.

The dressing-rooms are often only one room for each sex, with lavatories and W.C.s attached. The green room is best placed at the same level as the stage, but the dressing-rooms may, if desired, be placed on other levels, though they must be easily and quickly accessible from the stage. Platforms are usually 4ft. to 4ft. 6in. above the hall floor level.

For further details of stages, platforms and projection rooms for halls, *see* the sections on "Community Centres" and "Schools."

**Sanitary Accommodation**

The following may be taken as a good average for assembly halls. *For men:*—One W.C. per 100 up to 400 with the addition of one for every further 250 persons and one urinal per 25 persons. *For women:*—Two W.C.s per 100 up to 200 with one additional W.C. for every further 100 persons. It should be assumed that the public consists equally of men and women.

For staff and back-stage use the requirements are:—*For men:* One W.C. for 15 and two for 35 persons with one urinal up to 20 and two up to 45 persons. *For women:* One W.C. for 12 and two W.C.s for 25 persons.

Lavatory basins should be provided for staff and back-stage use and be associated with each group of W.C.s, etc., in the same numbers and proportion as W.C.s.

Natural light by means of windows or skylights is generally preferred. Adequate ventilation is essential.

**Cloakrooms**

Adequate cloakroom accommodation attached to assembly halls is essential. It should follow generally the information given for similar halls in the section on "Community Centres."

**Lighting for Halls**

Halls are required by the L.C.C. to have natural lighting by means of windows or skylights, to which suitable curtains and shutters have to be provided, in order that, during performances, meetings, etc., the windows and skylights may be obscured if desired.

An auxiliary system of artificial lighting is usually required for emergency use. Artificial ventilation is usually essential.

**Kitchen**

A kitchen is generally required in connection with assembly halls, together with adequate service rooms, which are used for the service of banquets, and for light refreshments in connection with dances, whist drives and similar entertainments; cooking to any large extent is not usually required, as meals are prepared elsewhere.

For further details of kitchens, bars, banquet planning, etc., *see* sections on "Hotels" and "Public Houses."

## Introduction

Courts may be divided into two main types; firstly, those dealing with criminal cases, and secondly, those for civil cases. All criminal actions are first heard in Magistrates' Courts, from which the case may be committed to County or Quarter Sessions or to Assize Courts; the court to which the case proceeds is dependent on the type and seriousness of the offence. An appeal may be made to the Courts of Criminal Appeal. Civil cases are heard at the High Courts and the County Courts, from which appeals may be made to the Appeal Courts and finally to the House of Lords. (*See* Fig. 1.) There are also certain other types of court for which special buildings or rooms are sometimes provided, for example, Juvenile and Matrimonial Courts, and Coroners' Courts.

In towns where Assizes are to be held it is usual to have two courts and sometimes three; one court is mainly used for civil cases, and the other for criminal cases, although both are generally equipped alike to serve each use if so required; also in many districts the Municipal Police Courts are also used for County Court purposes. Magistrates' Courts are not often held in the same building as Assize Courts, although in many areas the Magistrates' Court and County Court may use the same building. It is difficult to give precise planning information as to accommodation without knowing for what purposes the courts are to be planned; there is much variation in the number and size of the rooms to be provided, in addition to the actual court rooms, for each type of court. For example, in Assize buildings the rooms are of necessity much more numerous than in local Magistrates' Courts. Magistrates' Courts are often attached to main police stations and police offices, and have only a few essential rooms for the magistrates and witnesses in addition to the court room itself, as the cells and police offices, etc., form part of the police station.

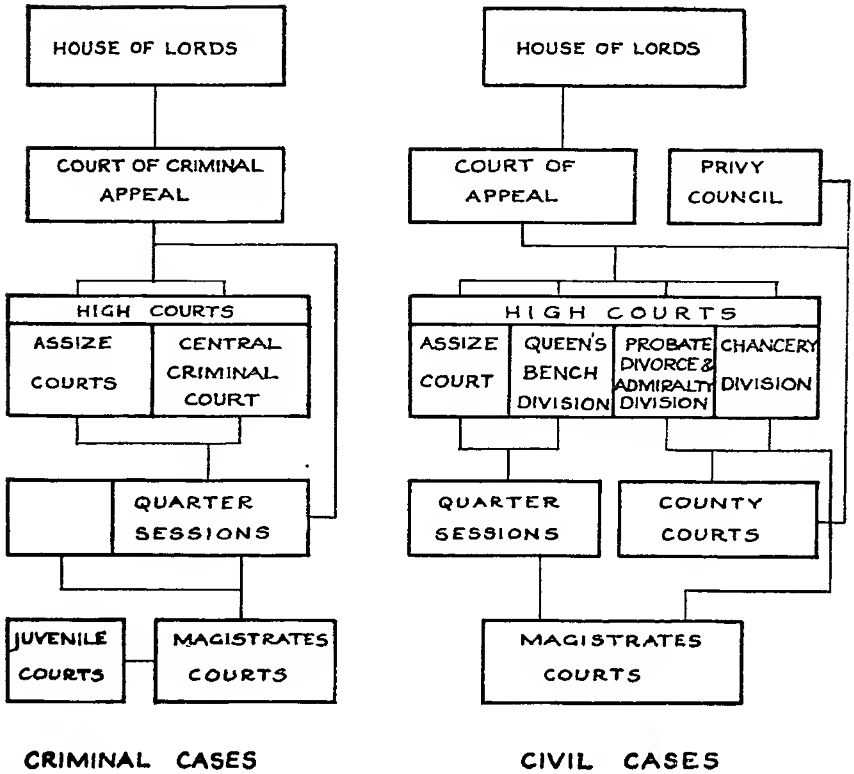



Fig. 1 General organization diagram

## Police Stations

Since the police station is the building which is most closely connected with everyday life, it is proposed to discuss the planning of buildings for this purpose and then to proceed from this to the various types of court buildings.

Police stations generally comprise rooms both for police administration and the temporary detention of prisoners; frequently, in addition, living and recreation quarters for the police officers.

The smallest unit of accommodation is the rural police cottage at which no business is transacted. It is residential only; it consists of a normal parlour type cottage. The next unit in size is a residence for a police officer in a rural area, at which business is transacted: it is marked with a notice indicating that it is a police building; the accommodation for this type comprises a dwelling as outlined above, with the addition of (a) a small room to serve as an office, and (b) a shelter for a bicycle, as the latter is a part of the normal equipment of a rural policeman.

The next type is a dwelling to which is attached a charge room and one or two cells. It is important to provide separate entrances for the house and for the charge room and that these should be placed as far apart as convenient, but with the entrance to the charge room or business part in the more prominent position. If the dwelling-house is to be used for constables or sergeants, a parlour-type cottage accommodation is needed, but if the occupier is to be of higher rank, the number and area of rooms should be increased. If, however, the dwelling accommodation is to be used for single men it should comprise a day room, kitchen, separate or cubicle bedrooms for each man, together with adequate provisions for bath, lavatory and W.C.

## POLICE STATIONS: PLAN TYPES, CHARGE ROOMS

### Plan Types

Fig. 2 illustrates diagrammatically the essential layout factors for the type of police residence with a charge room and cells attached. The charge room in this type is usually used also as a general office and filing room and for the public to make enquiries. All persons entering or leaving the business part of the building must pass by the person in charge, except for an entrance from the house directly into the charge room or lobby thereto. Cells must not open directly out of the charge room but should be approached from a corridor leading out of the charge room; this corridor should also give access to W.C.s and wash basins for the use of prisoners. A small enclosed yard for exercising prisoners is needed and should also be approached from the same cell corridor. The exercising yard must be well enclosed and screened from view from the street and entirely separate from any yard or garden attached to the house. The cells and approach corridors usually are of single-storey construction and in any case living rooms and bedrooms must not be placed over them. If W.C.s cannot be used, owing to lack of water, and earth or chemical closets have to be installed, these should be placed in the exercise yard and must not be approached from the normal enclosed cell corridor. W.C.s are sometimes placed in cells; see below.

Fig. 3 illustrates in diagram form the essential accommodation necessary for larger police stations in urban districts, which are increased or decreased in proportion to local needs. Living accommodation for the various ranks of the police force may be provided in conjunction with and additional to the police station, either on upper floors or in adjoining buildings, but the provision of such domestic accommodation has but little direct bearing on the planning of the station.

### General Circulations

The circulations of a police station are divided into three main sections, firstly for the officers, secondly for the prisoners, and thirdly, for the public. All circulations should pass through the same main entrance under the control of a policeman on duty, but it is often also essential to have another entrance placed in an inconspicuous position at the rear of the building from which policemen and prisoners can enter or leave without passing through the main entrance. The circulations should divide at the entrance lobby, the public and prisoners going to the charge room, which also serves as the general public office; a waiting room for the public and such persons as witnesses or those inquiring after lost property should adjoin the main entrance lobby.

The charge room should have direct access to the cell corridors or to a staircase leading thereto, for men and women prisoners. The cells for each sex must be separate, each section with separate W.C.s and lavatories and, when there are several cells for female prisoners, a room with sanitary accommodation adjoining is required for the police matron.

The cells should be planned to lead directly to an enclosed exercise yard, if such is provided. The entrance lobby or office corridor should also lead to the parade room, which is the main assembly room for the police and also serves as lecture, cloak, and general service room.

Attached to the parade room should be the police recreation room, mess room, kitchen and sanitary accommodation for the uniformed staff. A number of offices and workrooms are required to which the public may also need access, but only after first being received in the charge room; these rooms comprise offices for the superintendent, inspectors, detectives, clerks, rooms for photography, records, wireless, and rooms for women police with separate cloakroom and lavatory.

A drill yard is required from which the garages and cycle sheds may be approached; consequently a roadway connection to the street is needed, which also serves the purpose of a rear approach to the whole station for police cars and vans for prisoners.

### Charge Room, etc.

The public entrance lobby of a police station does not need to be very large, and should act mainly as a vestibule or draught lobby. Sometimes a small waiting room is required adjoining the entrance lobby and/or charge room; such a room is supervised and controlled by the officer on duty in the charge room, or on the entrance doors.

The charge room usually serves also as a general public inquiry room; in some larger stations a separate inquiry office is provided, and attached to it storage space for lost property is also occasionally planned. In all stations it is desirable to provide some suitable space for storage of lost property, fitted with shelves or racks for more bulky parcels, umbrellas, etc., but articles of value, which are usually smaller, are generally kept in cupboards in the inquiry office or charge room, or a separate strong room is provided.

Many schemes provide a separate entrance from the yard or a side roadway for police and prisoners to enter the charge room in order to avoid the necessity of using the more public access through the main entrance. The charge room itself varies in size according to the importance of the station, but the smallest area generally allowed is about 250sq. ft., increasing in large stations to about 400sq. ft., beyond which additional rooms are more general, rather than increasing the size of the charge room itself. It is essential that there should be direct access to the cell corridor or staircase thereto from the charge room by means of a different door from that used by the public.

Although in most stations some provision is made for accommodating prisoners in the charge room in a form of dock or enclosed seat, there are, however, many stations where nothing, excepting perhaps a seat, is provided. The proceedings in connection with the committal of a prisoner to temporary detention generally do not take long and several officers are always present, thus making the possibility of the prisoner escaping small.

The remainder of the equipment of a charge room, other than a dock, is the main counter, which divides the public from the police working space, desks for office work and storage cupboards and filing space. The counter is similar to a normal office inquiry counter about 3ft. 3in. high and 2ft. to 2ft. 6in. wide, usually with a flat top, but sometimes provided with one or two writing slopes and cupboards; a grille is not required on the counter front. The counter often extends the full width of the room between walls and a flap and wicket is then necessary. The desks are usually single- or double-

sided high desks with sloping tops with stools for ordinary clerical work; these desks often have kneehole and pedestal drawers.

The public space between the wall and counter should not be less than 6ft.; it is general to have some clear wall space for notice boards in the public space.

Fig. 4 illustrates two typical types of charge rooms, Type A being more suitable for larger stations and Type B for smaller stations.

Type A has an enclosed seat at the end of the counter between the public space and the office proper, which is used as the dock when charges are being read to prisoners; the counter occupies the remainder of the width of the room and is returned under the window to serve as a writing space for use by the public. This writing space is separated from the police desk adjoining by a screen which prevents members of the public standing at the counter from reading documents on the police desk.

A sound-proof telephone box is fitted in one corner of the room, a necessary arrangement when the main telephone exchange room is separate and not communicating with the charge room. The door opposite the public space leads to the cell corridor; it is so placed that prisoners do not have to be taken between or near desks, which might impede the passage of two or three persons abreast.

Type B is smaller than Type A, but similar in most respects, particularly as regards the circulation for prisoners; there is no dock, but merely a seat in the charge room. The main difference is that the telephone room, in which is accommodated the main switchboard, is approached from the charge room and may be used by the officer on duty when making calls, or in smaller or more rural districts the switchboard may be operated by an officer on duty in the charge room. It must however be remembered that the telephone is a very important factor in police work and the switchboard will generally need constant attention. The telephone room is often required to house a teleprinter in addition to the main switchboard.

Adequate window area is essential to ensure good lighting and is preferably placed on the left-hand side or in front of the main counter and writing desks.

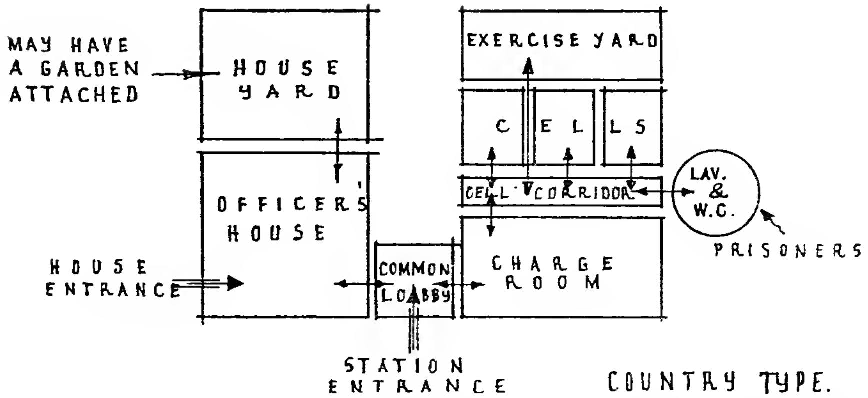



Fig. 2 Plan analysis of small type of country police station

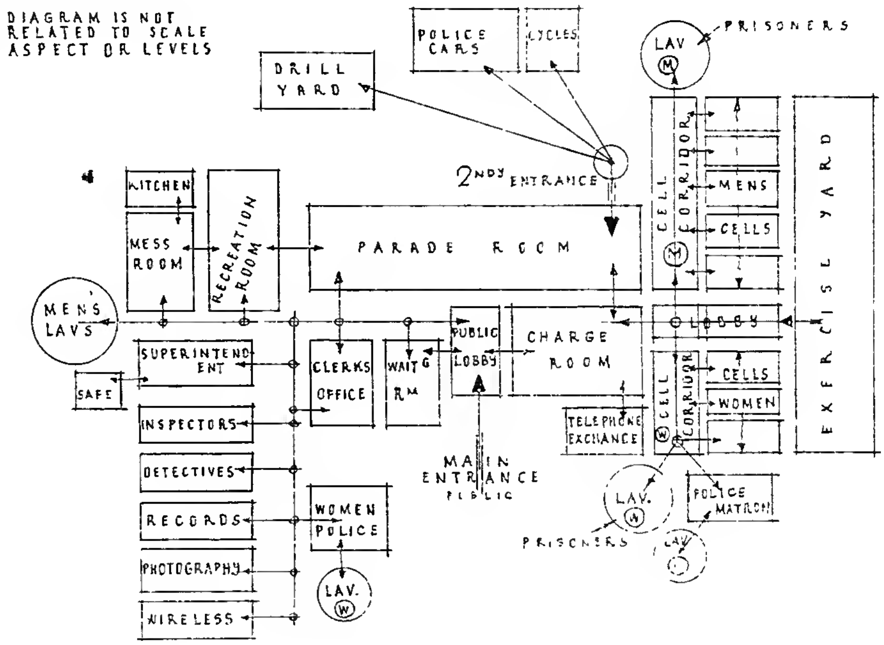



Fig. 3 General plan analysis of larger police stations

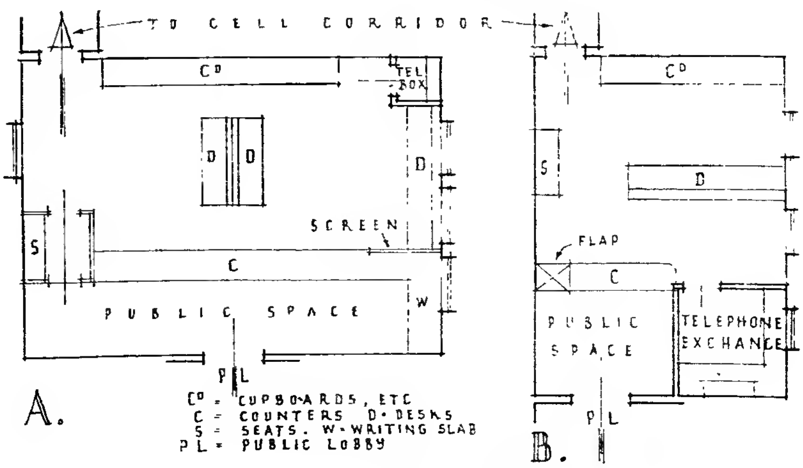



Fig. 4 The charge room in police stations

## POLICE STATIONS: OFFICES, PARADE ROOMS, RECREATION ROOMS, CANTEEN, CELLS

### Offices

Offices are required for various officials: these are normal office rooms and of varying sizes according to the work to be done in them. A fairly large office is required for the chief official in charge of the station, and this must be even larger for the chief constable of a county or borough controlling a large number of men; this room is needed for conferences and therefore requires a table to seat, say, a minimum of ten persons, in addition to a private desk.

A room is needed for inspectors; this is furnished with desks, with some filing cabinets and cupboards in addition. Detectives require a separate room and often a small additional room is provided for the chief detective officer attached to the station, who is in charge of the detective staff, particularly in more important stations.

These rooms have to provide for considerable filing space and also general bookshelves and office furniture; this filing is for current matters and is quite apart from the general and main filing in the record room which is at the chief offices of each administrative district. Record rooms, when provided, have to accommodate filing systems of various types, such as for letters and for similar documents, finger prints, photographs, etc. Tables for use in connection with the record room are needed either in the room itself, or in an adjoining room, where officials may do all the work in recording or consulting records.

More important stations require special rooms for photography, with a dark room attached, and one or more rooms for wireless apparatus; the sizes of the rooms are entirely dependent on the district to be served, but from the point of view of planning they should be well lighted and ventilated with special considerations in the equipment of the dark room and a light cut-off lobby. A small well-equipped laboratory is needed in most headquarter stations.

A general office is required in all larger stations, and in chief stations provision is needed for many clerks; a separate room for typists is then necessary adjoining the general office.

Other office accommodation which may be needed in larger stations, is a room with lavatory adjoining for women police. A hackney-carriage office is often required; the public require easy access to this office, which should be equipped with a counter, desks, and have its own filing system, if necessary in a separate room.

A map room is often required and is generally planned to be near the senior officers' rooms.

### Parade Room

This is a large room used for a variety of purposes, parades for patrols, lectures, first-aid classes, etc. It is equipped either with lockers or pegs and seats with boot-racks placed round the walls; it is important that there is direct and easy access from this room to the main entrance and it is usual to provide more or less direct access to the drill yard.

All but the smallest stations require a parade room, the size of which is dependent on the strength of the force attached to the station.

### Recreation Rooms

These are to some extent dependent on whether some of the force live at or near the station. When there are resident bachelors, recreation rooms have to be larger, but in all except very small branch stations at least one recreation room is needed, sufficiently large to house one or more billiard tables and leave space in addition for other purposes.

### Canteen

A small canteen and kitchen is needed in most stations, in which officers can get a meal quickly in off-duty times or breaks during duty; this canteen is apart from dining-rooms needed for residents. The canteen or mess room usually has a service counter with apparatus sufficient to heat up men's own meals or prepare light meals and refreshments such as tea and coffee, and with some storage facilities.

### Cells

These should be divided into two groups, for male and female prisoners. The cells may be placed on one or both sides of a corridor not less than 4ft., and better 4ft. 6in. wide, increasing to 5ft. if there are many cells approached from it; if the cell doors open outward, the minimum width should be 5ft. These cell corridors must be adequately lighted artificially and, when possible, should have windows and have smooth walls free from projections. When it is impossible to provide windows for ventilation of the corridors it is essential to install mechanical means of ventilation, or, as is quite usual, to allow for the formation of extract flues by which the air is drawn to the top of the building; the air is introduced into the corridors through the cells.

The two groups of cells should have a common lobby approached by a corridor or a staircase from the charge room, with cut-off doors giving access to each group. The warder's and matron's rooms can be placed adjoining this lobby, or, if preferred, they may lead off the corridors of the male and female sections, but should be on the cell sides of the cut-off doors. (*See* Fig. 5.)

The cells themselves are of two main types, one having a W.C. in each cell and the other without W.C.s, the latter being grouped in one part of the cell corridor. The two types are sometimes used together. Cells without W.C.s should have a cubic capacity of at least 600cu. ft., which is generally provided by having a floor area of about 6ft. 9in. by 10ft., with a height from floor to ceiling of about 9ft., which gives a floor to floor height of about 10ft. Cells with W.C.s require a greater area and should have a cubic capacity of at least 800cu. ft. There seems a tendency to provide more cells with W.C.s for male prisoners in recent police buildings. It is general to place the W.C. pan in the corner of the cell in order to facilitate the enclosing of the cistern and plumbing, as there must be no projections whatever and only the smallest possible sliding handle—and that at a low level—for operating the flushing cistern; Fig. 6 B shows a satisfactory cell layout with special reference to the enclosing of the W.C. flush-pipes.

The enclosing walls of cells should be at least 14in. brickwork and division walls 9in. brickwork; interiors of cells must be finished with glazed bricks or other smooth, hard materials which may be cleaned easily, and floors similarly treated. Structural floors and ceilings must be specially strong.

Every cell must have a separate window, generally fixed. Panes must not exceed 5in. by 8in. in the clear, and the total area should give at least 1sq. ft. of glass to every 80cu. ft. of space in the cell. Windows are usually of iron or steel, but if of cast iron, guard bars should be fixed outside. Windows of cells and, consequently, the cell block, must not be placed where they can be overlooked.

Doors and frames to cells must be very securely fixed, and are frequently covered with metal on the inner face turned round the edges so that it cannot be removed. A glazed inspection or observation panel is essential and this should be fitted with a cover on the corridor side only. A food trap is often incorporated in the door. Doors are hung to open inwards or outwards, each method having certain advantages in regard to handling troublesome prisoners, but doors opening outwards are fitted with bolts in addition to locks.

Every cell should have a fixed fitting to serve as seat and bed. This is generally a wooden bench about 30in. wide, 7ft. long and 16in. to 18in. above the floor, 2in. or 3in. away from the wall and open below to facilitate cleaning; these bench-beds must be very solid and securely fixed.

Artificial lighting is provided by bulkhead-type electric fittings of specially heavy construction, without wire or similar guards and with all connections to conduits buried. Switches should be outside the cells.

A bell from each cell to the warder's or matron's room, or to the room in which the officers may be on duty, such as the charge room in smaller stations, is now usual.

Ventilation of cells is of the utmost importance; this may be provided by omitting the glass in one or more panes of the window and fanlight and by substituting wire mesh; windows treated thus should be fixed high up near the ceiling and opposite the door, as shown in Figs. 6 and 7. Another method is to place an air-brick below the window or, better still, if the thickness of the window wall permits, to admit the air by means of an air-brick at a low level and form a duct up to an outlet in the sill of the window. If the fanlight over the door is totally glazed, there should be another air-brick from the cell to the corridor, at a high level. The air is extracted from

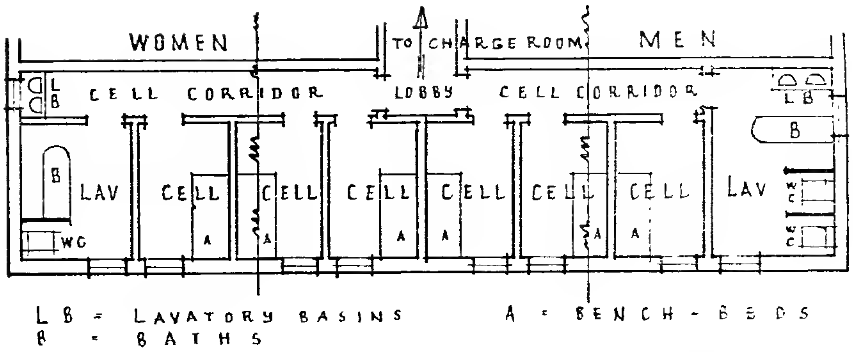



Fig. 5 Typical cell layout

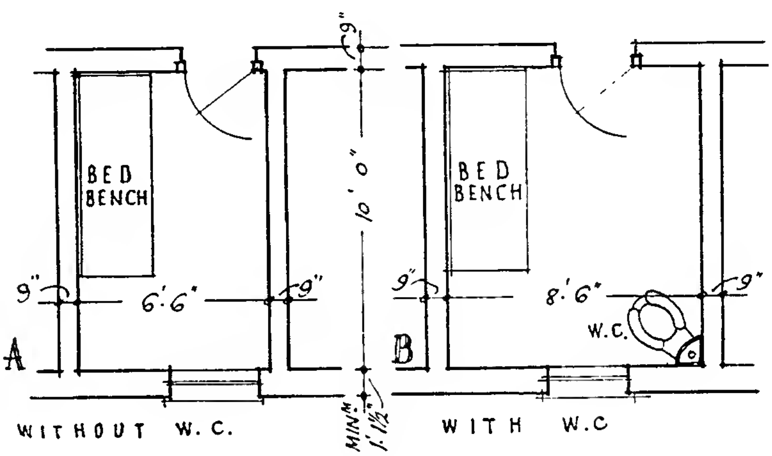



Fig. 6 Typical details of cells

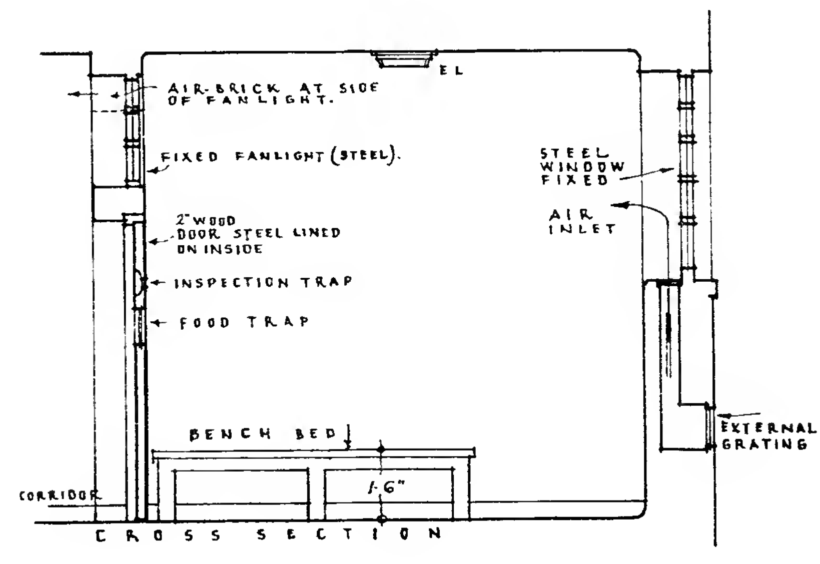



Fig. 7 Cells: typical section

the cells into the corridor and from the corridor either by means of flues, mechanical ventilation, or by windows, as described previously.

### Prisoners' Sanitary Accommodation

W.C.s are frequently provided in the cells and must be in such a position as to be supervised from the observation panel in the door, except that sometimes in cells for female prisoners, dwarf screens are installed.

When W.C.s are not provided in the cells, separate W.C.s at the rate of one for every ten cells and, if possible, a minimum of two W.C.s, should be provided off the cell corridor in a group to facilitate plumbing, as shown in Fig. 5. Facilities for washing must also be provided in the form of lavatory basins and sometimes with the addition of a bath, although the latter does not appear a very general provision. Fig. 5 shows two typical positions for lavatory basins; on one side (marked " women ") the basins are placed in the open end of the cell corridor, and on the other (marked " men ") the basins are enclosed in a room with a bath; either layout may be adopted in either section; when baths are installed only one end should be against a wall, with ample circulation space round the fitting. Basins should be in the same ratio as W.C.s.

### Exercise Yard

One exercise yard usually serves for both male and female prisoners; the yard should open off the cell corridor and should not be overlooked by surrounding windows from rooms other than cells or warders' rooms. The yard must be either entirely surrounded by the building or have a high wall to enclose it.

### Officers' Rooms

Rooms for the use of warders or matrons, when required, should be small, having an area of 100sq. ft. to 120sq. ft., and should be attached to the appropriate male and female groups. A police matron's room should have separate lavatory accommodation attached, or near, to it. Telephonic communication should be provided between the warder's and matron's rooms and the charge room if there is any considerable distance between these units.

### Court Buildings

Under this general heading it is proposed first to consider the planning of normal police court buildings which may or may not form part of a group of municipal buildings or be planned in connection with police stations. Separate buildings are often provided and usually have at least two court rooms with a number of other rooms for administrative and consultative purposes. As previously stated, justices' courts may also be used for other purposes than police courts, in which case slightly different arrangements have to be made, such as provision for juries. (A typical court of this kind will be discussed later.)

### Magistrates' Courts

Fig. 8 illustrates the typical circulations of an independent police, petty sessional or magistrates' court building. If attached to a police station very similar accommodation is necessary, except that cell accommodation for prisoners need not be duplicated, although care must be taken to plan the cell unit in a position that provides easy access to the courts.

At the main entrance there should be a good-sized vestibule with cut-off draught doors, as people may have to wait for long periods in the main hall. The main hall or crush space must be large enough to provide adequate circulation for all those passing between all rooms to which the public may require access. Off this main hall should be placed the courts themselves, waiting-rooms for the public and witnesses, the offices of the chief court officials and, if possible, the solicitors' room and one or more solicitors' consulting rooms.

The waiting-rooms do not have to be very large and areas of about 300sq. ft. are sufficient for most court buildings; a separate waiting-room is sometimes provided for persons (other than prisoners and witnesses) wishing to see the magistrates. Lavatory accommodation for both sexes must be provided for those using the general waiting-rooms, with an allowance of at least two W.C.s and two lavatory basins for each sex, with at least two urinals for men.

Female witnesses usually have a special waiting-room with lavatory accommodation adjacent, and for normal purposes a room about 250sq. ft. is adequate.

The courts may vary somewhat in floor area; many examples provide only about 800sq. ft., but 1,000sq. ft. to 1,200sq. ft. provide areas more easily handled in detailed planning; care should be taken not to make the court rooms too narrow as the circulations of the main part of the court must not be cramped; in addition, a narrow court allows insufficient length for the Bench. The number of magistrates varies considerably from session to session and as many as ten or even more may be present at any one time. A good minimum width for a police court is about 25ft.

Entrances to court rooms are of three main types; the public and witnesses from the main hall and waiting-rooms; the prisoners from the cells, generally directly into the dock up a staircase from the cell corridor in the basement; thirdly, the magistrates, who need direct access to the Bench from their retiring rooms.

A separate court is often provided for juvenile cases and this court is often used for other purposes such as matrimonial cases; a juvenile court should be cut off from other courts with a separate entrance from the street and separate waiting-rooms, sometimes divided, one used by boys and one by girls.

In any case separate lavatories near the waiting-rooms are needed for boys and girls. Waiting-rooms do not need to be more than 120sq. ft. if divided, or 200sq. ft. if both sexes use the same room.

A children's court is smaller than a normal court; an area of about 450sq.ft. to 500sq. ft. is generally sufficient; special public accommodation is generally not provided.

The accommodation needed for magistrates comprises a suite of rooms approached from a hall or wide corridor, generally at the ends of the courts opposite to the public entrance. The rooms necessary are: a large room which is in the nature of a board or common room and should have an area of some 500sq. ft. to 700sq. ft.: secondly,

retiring rooms, one for male and one for female magistrates, each of which should have lavatories adjoining. In many schemes only the retiring rooms are provided, the common room is omitted and conferences take place in the male magistrates' retiring room, which should then be large enough to seat at least ten persons round a table. The retiring rooms, if not to be used for conference purposes, need only be about 120sq. ft. to 200sq. ft. in area. A separate entrance to the building, leading directly on to the magistrates' corridor, is essential for the magistrates.

Offices for the court should provide a general office for several clerks, a private office for the Clerk to the Court and also for an Assistant Clerk if there is one. The public needs access to the general clerical office, which should have a counter. A separate entrance is sometimes provided to the offices as these are in constant use and the main entrance serving the courts, etc., may then only be opened at such times as is necessary. Lavatory accommodation for both sexes is needed for the staff of the Clerk of the Court.

The solicitors' room has an area about 200sq. ft. or more, depending on the number of courts in the building. Near it should be a small room which can be used for consultations between solicitors or between solicitors and clients.

Separate lavatory accommodation should be provided for the solicitors near their room or approached directly from it.

One or two rooms for probation officers should be provided; these may be about 120sq. ft. to 150sq. ft., and may be on an upper floor.

Other rooms which may be placed on upper floors are, for part of the clerical staff, filing spaces, and even the solicitors' rooms, although the latter is not very desirable.

The prisoners should have a separate entrance leading directly to the cell corridor, usually in the basement. The number of cells varies somewhat, but the layout is as previously described for police stations, separate groups of cells being provided for male and female prisoners together with a matron's and a warders' room.

It is general to provide accommodation for a resident caretaker by placing a flat on an upper floor.

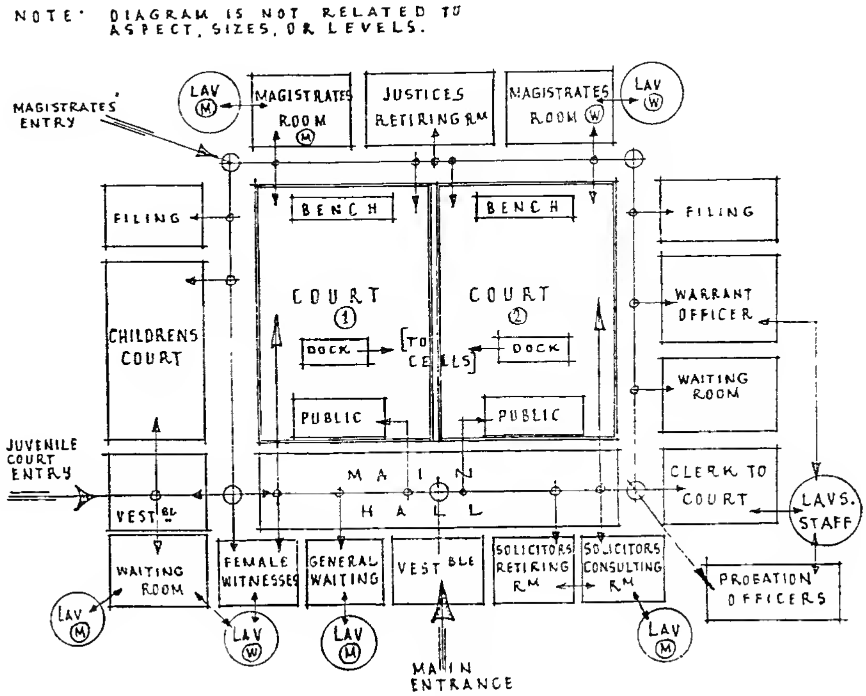



Fig. 8 Magistrates' Court Building: typical analysis

**Magistrates' Court Rooms: in detail**

A court varies from 800sq. ft. to 1,200sq. ft., and the minimum desirable width is 25ft. The usual plan is a rectangle with the bench or magistrates' seating at one end across the shorter dimension of the room. The floor level upon which the bench stands is usually raised about 3ft., or slightly more, above the well of the court in large courts and about 2ft. in small courts. This platform should be wide enough to accommodate two rows of chairs in addition to the fixed table, and should therefore be not less than 12ft. though frequently provision is made for one row of chairs only and the width may be reduced to 7ft. 6in. The Clerk of the Court is usually seated immediately in front of the Chairman of the Magistrates, in the centre of the bench and on a platform raised about 12in. above the well of the court, although in smaller courts, a single 6in. step is often used. Several chairs are often placed on each side of the Clerk of the Court, and these share the same table or desk, but are placed one step lower, with the table height similarly reduced. The Clerk requires a large table and therefore at least 5ft. 6in. should be allowed, to give 2ft. 6in. for chairs and a 3ft. wide table. In front of and facing the Clerk of the Court on the well level of the court, should be placed a number of seats with writing space, for the use of solicitors. These seats are generally built-in of tip-up type, and should be spaced at least 3ft. 3in. back to back. It is important to allow sufficient space between the edge of the writing surface and the seat when tipped up for a person to stand in comfort to address the court. It is desirable that the writing surface be 15in. wide, to hold foolscap papers and books, although this has seldom been adequately considered in court planning.

Two witness boxes are often provided, one on each side of the court, and these are generally raised 12in. or 18in. above the well of the court. Witness boxes should be about 3ft. wide and about 3ft. 6in. in depth; they are usually enclosed on three sides to a height of about 3ft. 6in. above the floor; a small flap seat is

usually provided, hinged noiselessly to the back of the witness stand.

The dock for the prisoners is usually placed in the centre of the court, behind the seating for the solicitors; the staircase from the cell corridor should deliver inside the dock enclosure, but it should be so placed that direct access into the dock is also possible; *see* Fig. 9. In some courts, however, the staircase from the cells is placed centrally between two courts and prisoners enter the room at one side near the dock at normal floor level, and walk across the room from the staircase to the dock, which is not very satisfactory. The staircase from the cells into the dock should be about 2ft. 6in. wide; without winders and cut off at the bottom, from the cell corridor, by a door. The floor of the dock should be raised at least two steps above the well of the court, which brings it to the same level as the witness stands.

The dock is usually about 10ft. long; the width is generally about 3ft. which allows sufficient space for a small writing-flap and also hinged wooden seats. The dock is enclosed on all sides, to a height about 3ft. 6in. above the floor of the dock, with part of the enclosure hung as a wicket for access to and from the court.

Seating is usually provided on each side of the court, on one side for witnesses waiting to be called and for press on the other; this seating is often placed on the same floor level as the dock and witness stand and arranged so that the seats face across the well of the court; this seating is formed of fixed benches, with a fixed front to which a writing surface is sometimes attached; the number of these seats varies considerably, but there should be access at both ends and preferably not more than six seats in a row, without dividing gangways.

The public often is placed at the end of the court facing the magistrates' bench in rows of fixed seats placed about 2ft. 6in. apart, back to back, and allowing about 1ft. 8in. run per person; these seats are usually raised in tiers to permit of a clear view of the court. In many plans the floor level of the lowest tier is often raised one or two steps above the well of the court. This public portion of the room should be separated by a permanent barrier from the rest of the court. In some schemes the public is placed in a gallery, leaving the ground-floor space for seating of witnesses, etc.

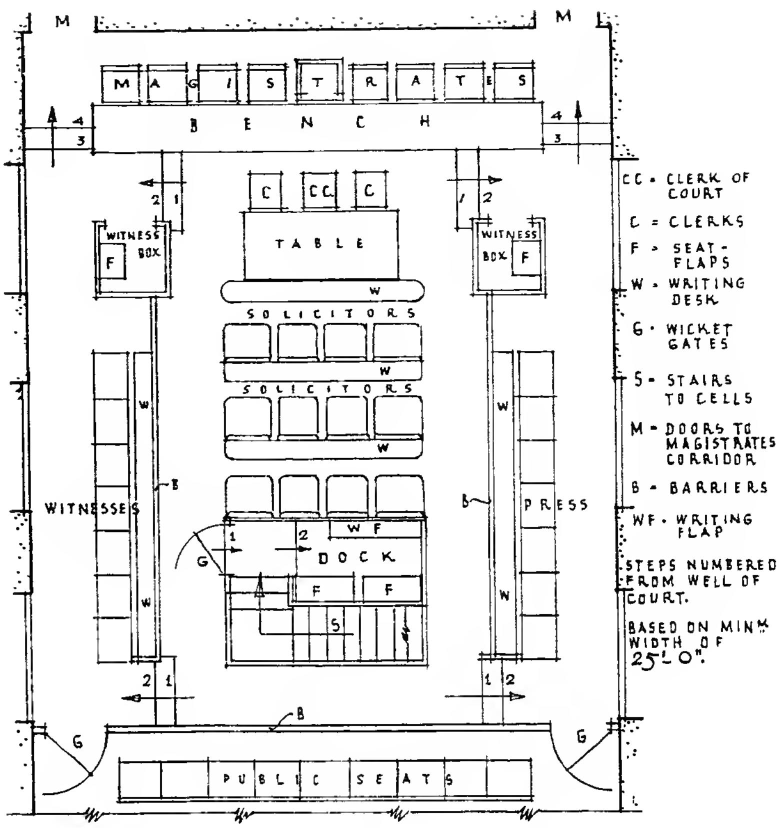



Fig. 9 Typical layout of Magistrates' Court

Courts should be placed in a quiet position within the plan. If, by any chance, it is necessary to place a court with one of its walls as an external wall facing a street, windows should be avoided if street noises are considerable. Courts are usually placed so that some of the lesser rooms are planned round the outside, thus isolating the courts and permitting windows to obtain light from wells rather than from street frontages. If windows are used to light courts, it is essential that they are placed on side walls and not facing or behind the magistrates' bench, and it is better if clerestory lighting is used rather than windows at lower levels. Many courts are top-lighted only, or top light is used in conjunction with some side windows or clerestory lights: this has proved quite satisfactory. Adequate ventilation is essential; if there is a doubt as to obtaining this by natural means, a mechanical ventilation system should be installed: this is also essential if there are windows facing into streets which, if opened, might allow too much noise to enter.

For reasons of good acoustics, which are of the utmost importance, courts should not be more than 25ft. in height, and 15ft. should be the minimum height, in view of the area of the room. Ceilings should be flat, or splayed at the walls only, for acoustic reasons, and deep beams transversing the ceiling parallel to the bench should be avoided. The doors should be reduced to a minimum in number for convenient access to the court, to avoid duplications of control. A door is required for the magistrates behind the bench, a door or doors for the public, which are sometimes used for general access

to the court, but in addition another door or doors are sometimes planned to give access to the court apart from the public entrances.

In some districts, magistrates' courts are also used as county courts, and it is then necessary to provide for a jury. (*See later*, under "Assize Courts," for details of jury accommodation.)

### Juvenile Courts

Special courts set aside expressly for juvenile cases are now frequently provided.

These courts are in the nature of ordinary rooms about 500sq. ft. in area; fixed furniture is usually avoided and replaced by tables and chairs to achieve a less formal character. Fig. 10 illustrates a typical layout for a juvenile court.

It should be noticed that the magistrates sit at one end of the room opposite the main door to the room, with the Clerk to the Court at a table adjoining the magistrates' table; on each side of the room are placed two long tables for witnesses, solicitors, parents and officials. The accused person usually stands for interview in front of the magistrates' table. A table near the door is usually provided for a police officer. Additional seating may be provided behind the two side tables for use when necessary.

A second entrance for use of the magistrates behind their table, is needed, to give easy access to the magistrates' rooms.

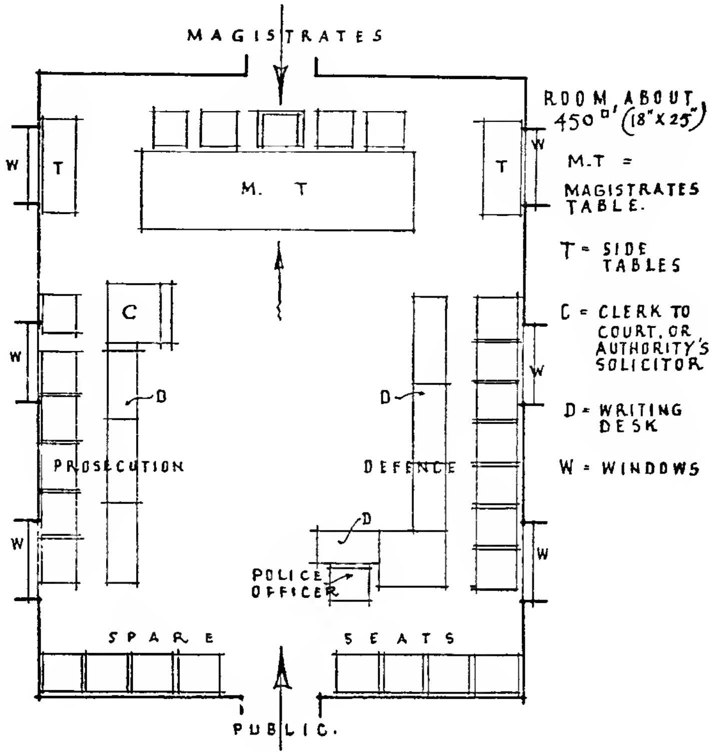



Fig. 10 Typical layout of Juvenile Court

### Matrimonial Courts

Special courts for this type of case have been set up in some districts and when a juvenile court is available this is frequently used. The arrangement needed for a court of this type is similar to that shown in Fig. 10 for juvenile courts, fixed furniture not being necessary. When planning rooms for courts of either of these types, adequate daylight is essential from sources not behind the accused persons when standing in front of the magistrates' table.

Adequate and properly placed artificial light is also important when the rooms are used for cases at special evening sittings of the court, as is the practice in some districts.

### Coroners' Courts

Special courts for this purpose are sometimes required; they need not be large rooms as the number of persons attending is usually small. A dock is not necessary, but provision must be made for a jury. Coroners frequently use police courts for their hearings when special courts for this purpose are not available.

### Sessions Courts

County or Quarter Sessions Courts are similar to police courts, but with a jury box, or to a small criminal assize court, as detailed later.

### Assize Courts

Special buildings are planned for Assize Courts in various centres throughout the country to which the High Court Judges go on circuit several times each year. It is general to provide at least two courts and sometimes three, although in a few towns one court only is provided. Although the courts are planned alike it is general to reserve one for civil cases and one for criminal cases. The reason for similar planning is that when cases of one type are concluded the judge may continue with the other type if the balance of cases necessitates this procedure. The main difference between civil and criminal cases is that a

dock is not needed for the former.

Fig. 11 illustrates the main analysis of the Assize Court building having two courts. A large entrance hall, called the Assize Hall, is most important as many people come to and wait in the court buildings.

From the Assize Hall should open rooms for male and female witnesses and for the police officers, together with the necessary lavatories. Leading also from the Assize Hall should be corridors from which should open all rooms for officials and lawyers, but these corridors should be so arranged that the public do not have uncontrolled access to these parts of the building. The various rooms to be provided are: for officials, the Sheriff, Under-Sheriff, Clerk of Assize, Registrar, Taxing Master; for the legal profession, robing rooms for barristers and solicitors, consultation rooms, a law library and often refreshment rooms; the robing rooms and lavatories must provide accommodation for both sexes.

The law library should be a large room to be used at times for court purposes, such as assessment of damages, or even as a third court. Consultation rooms, of which there should be several, should have seating accommodation for ten or twelve persons and be placed near the barristers' robing rooms if possible.

Immediately adjoining the courts, on the opposite side to the Assize Hall, should be a judges' retiring room and a jury retiring room for each court. Direct access from the courts to these rooms is essential; lavatory accommodation must be attached to each room.

A separate entrance is generally provided near the judges' and jury rooms; although it is usual to use the main entrance to the building.

The public have to be accommodated in each court in special public galleries, with access from the Assize Hall or near the main entrance.

Care should be taken to cut off noise of the Assize Hall from the courts and from rooms required for officials and the legal profession. A spare jury retiring room (making three jury rooms in all) is sometimes provided, as juries may consider verdicts for long periods and other cases are heard during this time; this room may also be used for such court purposes as outlined above for the law library in order to free the latter room.

Prisoners for criminal cases are brought to the building in prison vans, by an approach to the cells, preferably with an enclosed yard at the lower (cell) level. Cells are generally placed under the courts and adjoining rooms, with direct access by staircases into the docks in each court.

Luncheon rooms are usually provided for the legal profession, and frequently facilities in the form of a canteen are provided for the public, witnesses and juries. The judges more often return to their lodgings.

Assize Courts are generally about 2,000sq. ft.; great care should be taken to ensure good acoustics when designing plan shape and section. Top light with the addition of clerestory windows is the most satisfactory method of lighting courts adequately and without excessive shadows on the faces of those who may occupy the main speaking positions, such as the witness stand, jury box and seats for lawyers.

Double doors are essential between courts and any surrounding rooms other than the judge's room and the jury room. It is usual to have the rooms approximately two normal (office) stories in height in order to plan the public space in a gallery completely separated from the remainder of the room.

Fig. 12 shows a typical detail layout of an Assize Court.

The public gallery usually provides seating for about 50 persons; this seating is generally in the form of long benches or seats and is not made too comfortable, in order to discourage persons not having special interest in the cases from staying for lengthy periods.

The judge's dais should be the full width of the room and raised above the level of the well of the court from 2ft. 6in. to 4ft., as it is essential that the judge's seat should be on a floor level slightly higher (say 12in.) than the level of the witness-box floor and the floor upon which are placed the seats of the Clerk of Assize and other officials seated immediately in front of the judge. The judge's desk should be slightly raised above the general level of the remainder of the dais desk, at which may be seated a number of officials such as the Judge's Clerk, the Marshal, the Sheriff and the Judge's Chaplain.

The judge's entrance to the court must be by a door on the dais behind the bench and, although in many schemes this door is placed so that the judge's chair screens the entrance, it is probably better to place it to one side and balance this door about the centre line with the door required for access to the jury retiring room; also it is probable that a better decorative and more dignified effect together with a better acoustical treatment is obtainable if a wall space is arranged directly behind the judge's seat. A canopy acting as a sounding board is often designed over the judge's seat.

The desk and seats for the Clerk of Assize (at least two seats are required) are usually designed to form part of the judge's dais and bench. Both the judge and the Clerk of Assize require ample table space in front of them on which documents may be spread out. The Clerk of Assize must be so placed that he may converse easily with the judge by standing up, but he must not interrupt the judge's view of persons in the court when he is seated. The dais for the Clerk of Assize is usually placed from 1ft. to 2ft. above the level of the well of the court.

The dock is usually arranged towards the back of the court; it must be large enough to seat a number of prisoners (up to, say, 12), and an enclosure about 12ft. to 15ft. in length and 6ft. or 7ft. in width is desirable. Otherwise the dock follows, in detail, that described above for magistrates' courts. (*See* Fig. 12.)

Witness-boxes may be placed in either of two positions, although the main advantages point towards one of the positions as being undoubtedly the better, as shown in Fig. 12, with the box on the opposite side of the Clerk's dais to that occupied by the jury, so that the jury may see the faces of witnesses without difficulty.

The witness-box is usually about 5ft. by 3ft. and its floor should be raised nearly to the height of the judge's dais, which necessitates the floor level being about 2ft. above the level of the well of the court; the box is partially enclosed at about 3ft. 3in. above the floor, particularly across the front, which should be in the form of a desk.

The space between the desk of the Clerk of Assize and the dock is used by the solicitors and barristers. At the front are placed one or more large tables for documents and exhibits required in connection with cases; behind these tables are the seats for

solicitors and behind these the barristers are placed in two or more rows. Seats for barristers should be of a tip-up type and should have adequate desk space (at least 15in. wide) in front of each seat. These rows of seats should be stepped up to ensure that everyone has a clear view of the judge and witness-box; this seating should be spaced at least 4ft. from back to back of rows, and at least 2ft. centre to centre of seats.

It is desirable that there should be access from the judge's dais to the witness-box as well as the normal access by steps from the well of the court; a flap seat should be provided.

The jury box should be placed on one side of the court with the floor level of the front row of seats either at or just below the level of the judge's dais; the back row of seats should be raised one or two extra steps to ensure clear vision of dock, witness-box and the seating occupied by barristers. The jury require 12 seats, which are generally in two rows occupying an enclosure about 15ft. by 6ft. 6in. or 7ft., inclusive of access steps. Comfortable tip-up seats are needed, together with a writing surface in front of each person. The jury box is usually placed on the judge's left-hand side, but owing to the placing of two courts side by side, as is usual in court buildings, it is often necessary, for reasons of access and the placing of judges' and jury rooms, to exchange the positions of the jury box, witness-box and press box. (*See* Figs. 11, 12 and 13.)

It is usual to provide seating for the press in an enclosure, somewhat similar to that used as jury box, on the opposite side of the court to the jury. Such an enclosure provides for about six pressmen, which is generally found to be sufficient. The fitting-up of the enclosure is also similar to the jury box, tip-up seats and a writing surface being the only requirements.

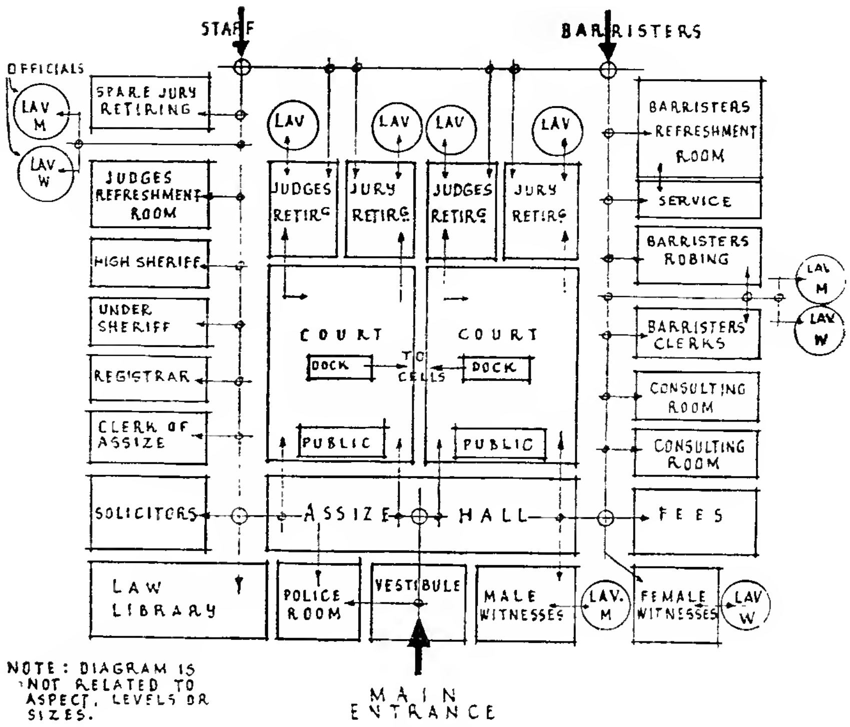



Fig. 11 Assize Courts: typical plan analysis

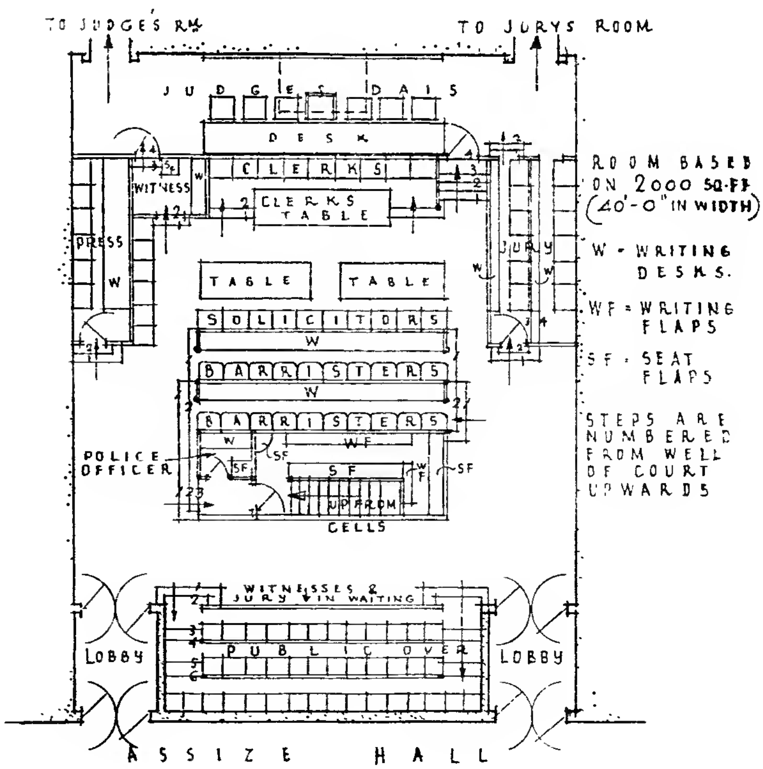



Fig. 12 Assize courts: typical detail layout

## COURT BUILDINGS: JUDGE'S ROOM, JURY ROOM, BARRISTERS' ROOMS

### Judge's Room

This room should be directly attached to the court room with an approach through a small cut-off lobby. These rooms are generally given an internal position; with the advantage of ensuring quietness and cutting off from all possibility of being overlooked by public or semi-public streets or gardens. The planning of the judges' rooms in internal positions presents difficulties of circulation, lighting and ventilation; top light and overhead ventilation alone are undesirable in rooms of this type which are finished in the manner of a private office or a library of a good quality; it is therefore better if suitable areas or light-wells can be planned to give side light and proper ventilation for the lavatory and W.C. accommodation which must be planned adjacent to the room.

The area required for the judge's room is 200sq. ft. minimum but, since this room often has to correspond on the plan with the jury room it is very frequently made somewhat larger in area in order to balance the minimum area needed for a jury room. The judge's room should also be cut off by means of a lobby from the main circulation corridor.

Fig. 13 illustrates a good typical layout of a judge's room, the approach lobbies to the corridor and court room and lavatory and W.C. The lighting area is planned in conjunction with the lobby between the judge's room and the court room, and, since it lights part of the main circulation corridor around the court room in addition to the judge's room and W.C., this area is not uneconomical and greatly assists the ventilation and pleasantness of both corridor and judge's room, allowing daylight into the corridor and avoiding total top lighting for the judge's room.

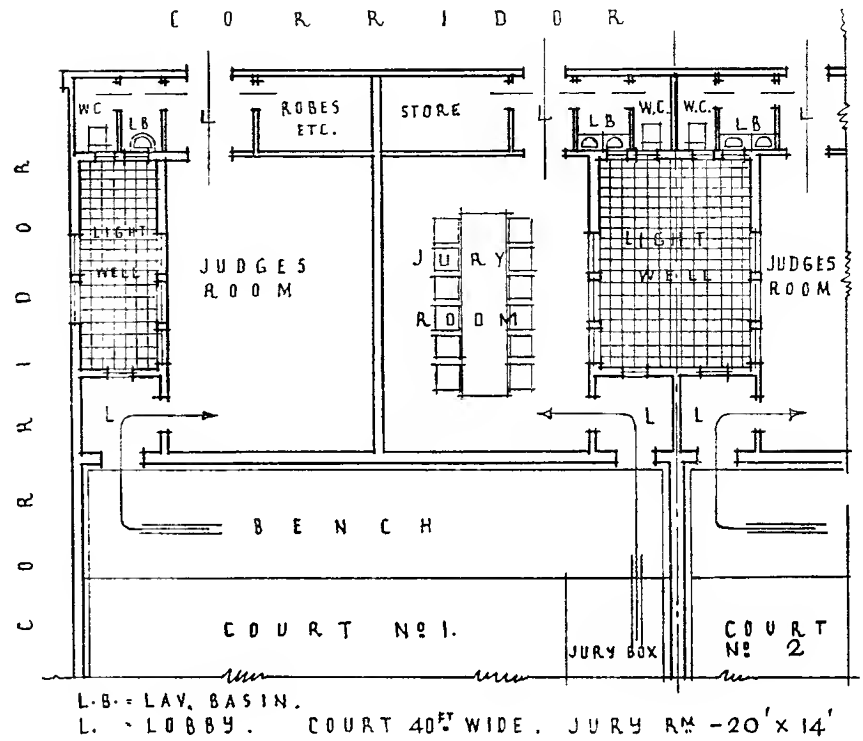



**Fig. 13** Assize Courts: typical layout for judges' and jury rooms

### Jury Room

This room, like the judge's room, must have direct access from the court room on the side of the jury box and also from the main circulation corridor on the opposite side. A lavatory and W.C. attached to this room and approached from it without entering any general circulation is essential. The minimum size for a jury room, to provide for a comfortable arrangement of furniture and adequate space round a central table which has to seat the 12 jurymen should preferably be 20ft. by 14ft. The points outlined above in connection with lighting and ventilating the judge's room apply equally to the jury room. An internal position away from external walls is of great importance for both reasons of privacy and of quiet. A typical layout of a jury room is shown in Fig. 13, together with its relationship to the main circulation, court room and internal lighting areas; this figure is based on the placing of two court rooms side by side and, in consequence, the central area serves as a lighting source for both the jury room of Court No. 1 and the judge's room of Court No. 2, since it is desirable to keep the jury on the same side of the judge in both courts.

### Barristers' Rooms, etc.

The principal room used by barristers is a robing room, which is generally about 750sq. ft. in an Assize Court building having two or three courts. The room is fitted with a considerable number of lockers for clothes, papers, etc., and is generally furnished with writing tables, chairs and some easy chairs. It is usual for this room to have a position on the exterior of the building, but such a position should be chosen to avoid overlooking streets carrying heavy traffic.

Adjoining the barristers' robing room there should be placed a lavatory and W.C. accommodation for both sexes.

A room of some 400sq. ft. in area is needed adjoining the barristers' room for the use of barristers' clerks; this room should be fitted with lockers or hat and coat hooks, and should be furnished with tables and chairs. The consultation rooms, of which two or three at least should be provided, require an area of about 150sq. ft. to 200sq. ft. each. A quiet and well-lit position, both as regards external traffic noise and noise from internal circulation corridors, is very important. The rooms are usually simply furnished in the manner of a board room, with a single large table and a number of chairs.

A special consultation room or visitors' room is needed as part of the prisoners' accommodation on the floor below the court room for prisoners in consultation with lawyers and for interviews with friends.

### Solicitors' Rooms

A retiring room for solicitors (about 500sq. ft. to 600sq. ft.) with lavatory and W.C. accommodation for both sexes adjoining, equipped and furnished as the barristers' robing room, is required; it is usual to make this room rather smaller than the barristers' room as many of the solicitors return to their offices between cases and only use the retiring room as a cloakroom or room to consult or instruct their clerks, etc., before or between cases. A solicitors' clerks' room, as for barristers' clerks, may be needed, with similar equipment and furnishing; it should have an area of about 300sq. ft. to 400 sq. ft.

### Rooms for Officials

Private rooms or offices for important officials of the court, such as the Sheriff and Clerk of Assize, require floor areas of at least 200 sq. ft.

Offices for the more important officials should be grouped together; it is preferable if those for the Sheriff and Under-Sheriff are placed together and near the court most likely to be used for criminal cases. A private lavatory adjacent to the rooms for chief officials is frequently provided. A room for payment of fees and for the use of the Taxing Master should be in close proximity to the Assize Hall and the courts, although grouped with the offices; this room usually needs rather more floor space than a normal office. All other accommodation for officials is in the nature of straightforward offices, the detailed planning of which does not require special comment.

# Museums and Art Galleries

## INTRODUCTION, SITES, CIRCULATION

### Scope

This section covers the planning of public museums and art galleries in control of national, municipal and public authorities, excluding museums and art galleries constructed for private use either by individuals or dealers in works of art.

### Introduction

Museums and art galleries are often associated and housed within the same building, excepting certain larger national collections, which, by reason of size, require separate buildings.

Museums and art galleries have to satisfy two main groups of users, (a) the general public and casual visitors and (b) students and research workers.

Galleries may have to provide accommodation for permanent and semi-permanent exhibits, or special exhibitions, held from time to time, when objects of many different categories may have to be displayed.

The sizes and classes of articles to be displayed in museums or art galleries vary considerably and sections or even whole buildings are devoted to applied art, including furniture, tapestry, pottery, jewellery and ironwork; ethnology; science, including engineering, natural history and geology; trade and industrial museums; folk museums; and art galleries for the display of sculpture, painting, engraving, portraits and miniatures. The division of the types or classes of exhibits is somewhat difficult to mark clearly; when it is necessary to separate them into different buildings certain overlapping may be unavoidable.

Larger towns usually group the whole of the museum and art displays in one building, although sometimes it is found desirable to keep certain collections grouped in separate buildings, or form special museums for one or more groups of exhibits, such as natural history or local folk or industrial exhibits.

In many districts some provision is necessary for the display of exhibits in the open air, either in courtyards of museums or, when whole buildings are involved, as might be the case with folk museums, in special parks or gardens.

Provision should be made for lectures to be given in conjunction with displays and for this purpose a properly equipped lecture theatre with facilities for a lantern and sometimes for a cinematograph apparatus should be planned.

The two main groups of users, namely, casual visitors and students, make the problem of the proper display of exhibits somewhat difficult and the two groups also have considerable effect on the design of the main circulations for the building; certain exhibits have to be well and attractively displayed to interest the casual visitor, while the bulk possessions of museums may often be kept in special galleries and rooms for the use of students only; but at the same time exhibits displayed for visitors must be available and be shown in a manner useful to the serious student.

Museums and art galleries must be designed in a very flexible manner, as it is impossible to anticipate future acquisitions or bequests; these may be single pieces or whole collections of articles, either small or large, which must be displayed as a whole.

Actual settings for exhibits are a somewhat controversial matter, but it is very certain that settings must be in keeping with exhibits and not of such a nature as to detract from the objects displayed.

### Sites

Museums and art galleries are important public buildings demanding good sites and good site-planning. Space for future extension is desirable, but as many museums are built on urban sites, facilities for extension are often difficult. Urban sites centrally placed are probably more advantageous than less crowded situations on the outskirts of towns, involving considerable travelling for the majority of visitors, students and staff. Museums and galleries centrally placed are likely to be of greater benefit to the community, especially in connection with temporary special exhibitions. In any modern project, car parking facilities should be allowed for, and must therefore enter into the general site considerations from the initiation of a scheme.

Many museums and art galleries have to be multi-storeyed buildings, especially on central urban sites. Consequently side lighting only is available for galleries placed on lower floors over much of the site area, but, by careful consideration of the section, top or high side light may be made available for a number of rooms, leaving the remainder for use where normal side light from windows is suitable for the particular objects to be displayed. Factors controlling the lighting of galleries are given later.

### Circulation

The circulations of art galleries or museums may be divided into three main groups: first, the public circulation both for visitors and for students; secondly, goods or exhibits circulation from the point at which they arrive at the building until they reach their final position, and for movement afterwards to new positions or for renovations; lastly, the administrative circulations affecting the staff, comprising curators, attendants and cleaners.

Fig. 1 illustrates in diagram form the essential circulations involved in a museum building. The public enters from the main front and, for supervision, it is desirable to have one public entrance only. At the entrance should be placed facilities for general inquiries, stalls for the sale of catalogues, guide books and photographs, and cloakrooms where clothing, sticks and umbrellas may be deposited. Lavatories are needed for the public, and it is often convenient and advantageous to place these in a central position near the entrances, but perhaps at a different level, as, for instance, on basement or lower ground-floor levels. The diagram shows alternative treatments (A and B) of the central space around which the galleries are placed; this space being either used as an open courtyard or as a central hall.

The building indicated may be of a single- or multi-storeyed type, whatever the treatment of the central space; but if light is not available from the courtyard the span of the encircling galleries would probably need to be less than when there is a secondary internal source of light.

In either type, the central space should be available as a secondary circulation, so that it is possible to return to the entrance without full circulation of galleries.

The entrance for goods should be provided at the back or side of the building and should lead to rooms used

for unpacking, repairs and other administrative purposes. This entrance should deliver to the main goods circulation, which will involve a lift or hoist for handling larger and heavier objects between the entrance level and the galleries; hoists may be placed almost anywhere in the building to suit the convenience of handling objects from workshops to galleries.

Staff in smaller museums often use the main entrance; in larger schemes the staff entrance is grouped under the same control as the goods entrance. Staff rooms should be related to the entrances and work rooms.

Rooms for the use of officials, staff and students have to be distributed in various parts of the building, partly in conjunction with galleries and partly, as, for instance, the workshops, in relation to the circulation of goods.

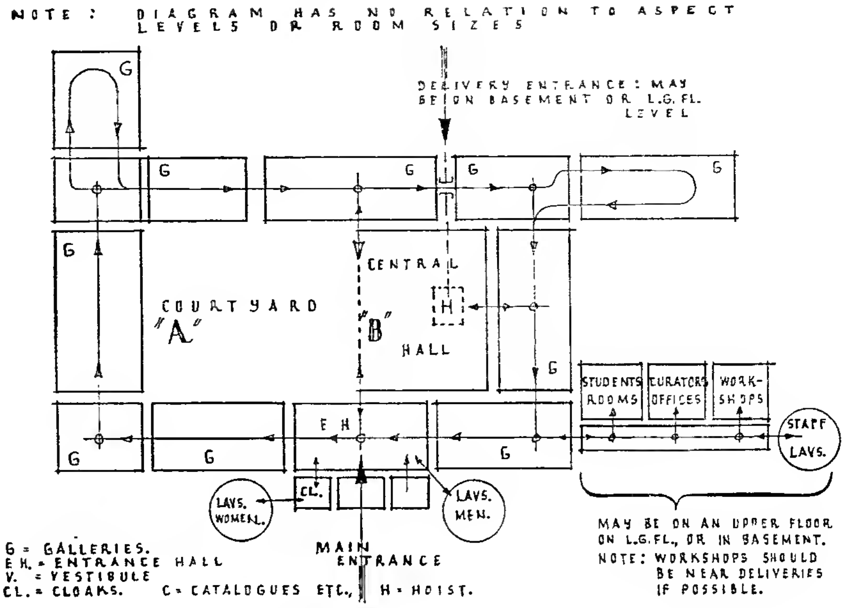



Fig. 1 Typical plan analysis

**Entrances**

It is usual to have the main door or doors open during hours when the public is admitted and to have two sets of inner doors, one for each direction. Inner draught doors may be of any of the usual types, but should open in the direction of the traffic; revolving doors have the advantage of assisting to preserve even temperatures in the entrance hall, and of reducing draughts from much used doors.

Some galleries and museums require turnstiles to control all persons entering and leaving, either to count persons visiting, or because charges for admittance are made on certain days of the week. In some buildings a portable type of turnstile is used for this purpose, and taken away and stored on "free" days. It is preferable if turnstiles can be planned to leave space for an inquiry counter and, possibly access to certain offices, before arrival at the point of control.

At or near the main entrance should be grouped various facilities for visitors, such as cloakrooms, public telephones, toilets, information and sales counters. Some buildings usually have one counter at which inquiries and sales are dealt with. In larger schemes very much more counter space is essential for display of books, pamphlets, postcards and photographs and then information and inquiry counters should be separated; in addition to the actual counters there should be some space,

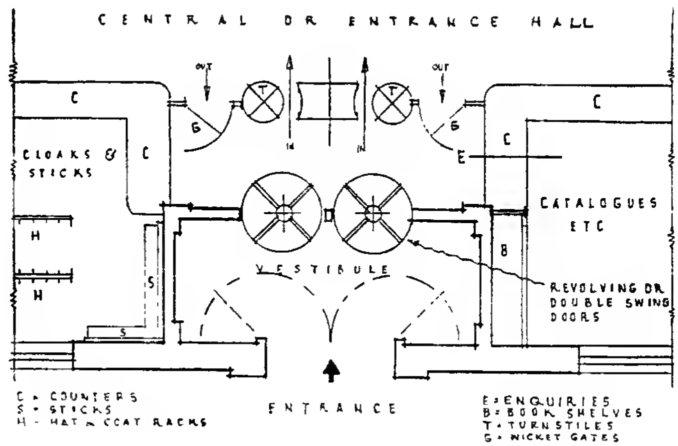



Fig. 2 Entrances

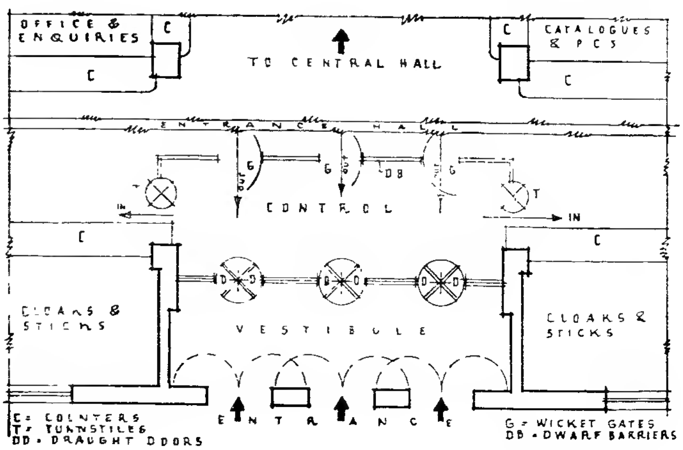



Fig. 3 Entrances

such as a small room, available for storage of reserve stocks of publications, etc., offered for sale.

Many museums and galleries require all parcels, sticks and umbrellas to be deposited by visitors, so that cloakrooms with counters fitted to take these articles, together with clothing, such as overcoats, which visitors may wish to leave, are essential. These cloakrooms and counters must be placed near the main entrance in positions where all visitors pass them before entering the galleries. It is preferable if clothing is hung on numbered coat-hangers with hat-racks over as detailed in other sections, and screened from public view; the face of the screen may be used for umbrella racks and the under part of the counter should be fitted with shelving to receive parcels, bags and similar articles.

It is very important that the cloak counters as well as all other counters should be designed as part of the general layout of the entrance hall and planned to direct visitors along the main circulation and not to interrupt easy circulation.

The entrance hall is the hub of the circulation, through which all visitors enter and leave, and consequently must not be cramped in area; there should be ample space for parties to assemble to await guides and lecturers without obstructing normal circulation of visitors.

Multi-storeyed museums should be equipped with passenger lifts serving all floors and some should be planned in positions convenient for the main entrance, so that visitors may go directly to whichever floor they desire without passing through ground floor galleries.

Lavatories for visitors should be placed near the entrance, although not approached directly from it.

Fig. 2 illustrates a typical entrance for a small museum or art gallery. The main entrance doors are opened back during visiting hours when entrance is effected by two revolving doors or pairs of swing doors, one for entrance and one for exit.

Inside the revolving doors is a space between entrance doors and turnstiles, sufficient to prevent congestion among those entering and leaving the building. Inquiries at the counters are made here without passing through the turnstiles.

The turnstiles are centralized to separate those entering and leaving, with the turnstiles controlling entrance only.

The counter arrangement shown on Fig. 2 provides for cloaks on one side and for information and sale of publications on the other side of the entrance. By using depth needed for lobbies and turnstiles ample space is available for hat-and-coat racks screened from view, and for working and storage space on the sales side.

The length of counters and area of space needed are dependent on the size of the museum, but if, in the future, additions are likely to the gallery buildings, the entrance hall and counters should be designed to permit extended accommodation essential when the building reaches ultimate limits.

Screens behind counters do not need to be more than 7ft. in height, for ample light to be available for counters from windows in external walls. The height of the entrance hall is likely to be at least twice or three times the height of such screens.

Fig. 3 shows a typical entrance to a larger museum building. Three outer sets of doors give access to a vestibule, in which are placed three inner sets of swing or revolving doors. Control is by turnstiles placed at each end of a dwarf cut-off barrier for those entering, and gates in a central position for exit purposes, to separate traffic into two streams.

Immediately adjoining the entrance turnstiles are the cloak counters and cloakroom spaces; these are divided into two groups, which can only be justified in a really large building because of duplication of staff; this preserves good circulation, as persons entering by either turnstile pass close to a cloak counter before entering the galleries.

Opposite the cloak counters on each side leading to the central hall are placed counters for information and sales, which in a large building require considerable lengths of counter to display effectively a large number of publications and to effect sales at peak hours.

The counters are continued on each side of the approach vestibule to the central hall. A large entrance hall is essential in a museum of the type suggested, since it is the central concourse where congestion and ambiguity as to circulation must be avoided.

## PUBLIC CIRCULATION, GALLERIES

### Public Circulation

There are various problems which arise in connection with the arrangement of circulations through buildings of the gallery type and a number of methods of planning have been tried, each of which has points of value for varying kinds of exhibits.

Convenient arrangement of galleries and other spaces usable either for display or study and to permit future reorganization is essential; in most schemes it is possible to anticipate to some extent future requirements.

The method of lighting galleries has considerable bearing on the number and arrangement of floors, since lower floors of multi-storeyed buildings can only have side light over much of the floor area.

Dead-ends in circulation should be avoided in galleries with exhibits mainly on one side, as in galleries with windows on one wall only; but where the lighting permits of circulation within a gallery, visitors may pass along one side and return along the other wall.

In some schemes there is an obligatory circuit which visitors must follow without turning back; such an arrangement is often very tiring and is most inconvenient for those, especially students, wishing to proceed directly to some particular group of exhibits. It seems desirable, at least in large buildings, to arrange the circulation so that it is possible to reach each section from the main entrance with the minimum amount of walking and passing through other sections.

A type of circulation which has some advantages is one that has a main route through a number of major galleries showing grouped exhibits, and making, where possible, minor circulations within each group for visitors desiring to view extended displays of any one group.

Another scheme of circulation layout is based on a circulation corridor from which all galleries are approached, so that visitors pass the openings to all galleries, but only enter those galleries in which they may have a particular interest.

Certain circulations, such as those to offices, may have to be available at times other than those when the galleries are open and therefore they should be arranged in such a manner that the gallery circulations may be cut off, but without the introduction of a separate external entrance which involves additional supervision.

Fig. 4 illustrates two types of circulation for museums or art galleries; Diagram A shows the circulation passing through the galleries, and Diagram B is based on a corridor system for main circulation, with series of galleries approached from the corridor. The placing of doorways or openings between galleries depends partly on the source of light and partly on the necessity of leading visitors past the exhibits in a particular way to suit a definite arrangement of objects. It should be noted that in Type B some galleries are approached through others and do not each have separate access from the corridor.

The corridor in Type B may be artificially lighted, if not on the topmost floor, in which case rooms may be placed on the side opposite to the galleries; these rooms may be used as galleries, often of a smaller size, or for such purposes as offices, study rooms, store rooms, or even toilet rooms. This type of plan offers excellent opportunities for the provision of study rooms and rooms to house exhibits not normally available to the visiting public in close proximity to the main galleries in each section in a manner which is often difficult to plan in a scheme based on gallery circulation only, as in Type A. Type B also makes easier the closing of a group of galleries for rearrangement of exhibits or while a temporary exhibition is being arranged or removed.

### Galleries

The actual planning of rooms to be used as galleries in regard to size and shape does not require any particular detail consideration, but is mainly a matter for planning in conjunction with the method of lighting and the purpose for which the gallery is to be used. The rooms are virtually shells in which varying types of exhibits may be shown, except that generally a room designed to provide proper lighting for pictures is unlikely to be required for the display of furniture, panelled rooms or ceramics in cases. In buildings to be used for varying purposes space allocations may be made by selection of suitable plan positions to give the correct method of lighting desired for any particular group of exhibits; for instance, topmost floors or other positions where top or top-side light is available, are probably better suited for the display of pictures, while furniture and articles in cases may be perfectly satisfactory with side light from windows only.

Fig. 5 illustrates typical gallery plans where top light is not available and the rooms depend upon windows either at normal or high levels. Exhibits of all types may be shown in such rooms, although they may not be ideal as picture galleries; side light for pictures may be perfectly adequate if provision is made to obtain the correct angles of light on the pictures by using screens having different plan shapes as suggested on Fig. 5.

The window area and particularly the height of windows, influences the width of galleries; in normal circumstances galleries may be 20ft. to 30ft. in width and very much more if the height of the gallery, and consequently the window heights, will permit. A good general rule for normal galleries lighted from one side is 10ft. to 12ft. in height, which may be increased so as to be equal to the width of the gallery. For many purposes high galleries are not needed; but picture galleries where large paintings are to be shown should be at least 12ft. high, while galleries for sculpture and other large objects may need much more height.

Windows should be about 3ft. to 3ft. 6in. from the floor to the sill, and should reach up to about 12in. from the ceiling if flat, or from the springing line if segmental.

However, in some galleries high side light may be needed and in these circumstances the sill level may be 6ft. or 8ft. above the floor level, thus permitting medium-sized pictures or exhibit cases to be placed below the windows. Such high side lighting implies generally that the major objects are displayed in a central position or on the wall of the gallery opposite to the light source.

Room sizes, particularly the height, should not be such as to dwarf exhibits, as is possible if, for instance, small pieces of furniture are shown in very large and high rooms.

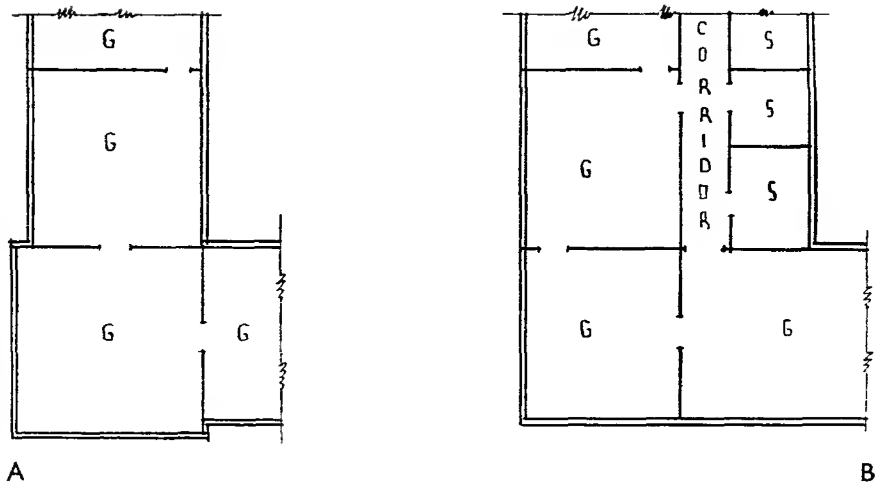
Since top light is so very important and preferable to side light for the lighting of galleries for many purposes, it is often necessary and desirable to design the section of multi-storeyed buildings in such a manner that, by the introduction of set-backs on upper

floor levels, top light may be arranged for many additional rooms.

Fig. 6 shows two plans and sections where set-backs have been planned in order to provide top light to rooms on lower levels which could only be side-lighted from windows if all the floors had the same span. Type A has two galleries on the lower floor and one gallery above placed centrally on the span of the lower floor and, in consequence, all the galleries on both levels can be provided with top light with or without the addition of side light as desired; the circulations in this example must be through the galleries themselves on the upper floor, but a corridor can be arranged for the lower floor galleries, if required.

Type B on Fig. 6 shows a building having four floors in all, but, if necessary, the lowest floor might be a basement or lower ground floor for service use, or it might be used as ground floor galleries, or, alternatively, it could be omitted when a large number of side-lighted galleries or service rooms is not required. The planning of the lower two floors is based on corridor circulation for access to galleries and other rooms and these circulations are lighted either artificially or by borrowed lighting from the galleries on each side. The first floor level on the section has the outside galleries on one side top-lighted by the setting back or narrowing of the gallery over it and, by the elimination of the corridor on the second floor; this setting-back on the second floor provides a narrow gallery with top light available, as there is another set-back on the third and top floor; narrow galleries of the type suggested are often greatly appreciated in museum buildings and are useful for the display of a number of different types of objects. The topmost storey is top-lighted; here the galleries are planned on the non-corridor basis of circulation.

The raking line of the one side of the section discussed above is very useful for courtyards, as the setting back reduces the effect of enclosure produced by high surrounding walls and assists very greatly the lighting in a courtyard and its surrounding galleries. Also, the vertical line of the façade on the other side of the section may be very useful in connection with the elevation to an important surrounding street. All the windows on the one façade may be designed as similar-sized openings, since they light galleries of similar span




KEY
G—galleries
S—small galleries, students' rooms, lavatories, etc.

Fig. 4 Circulations

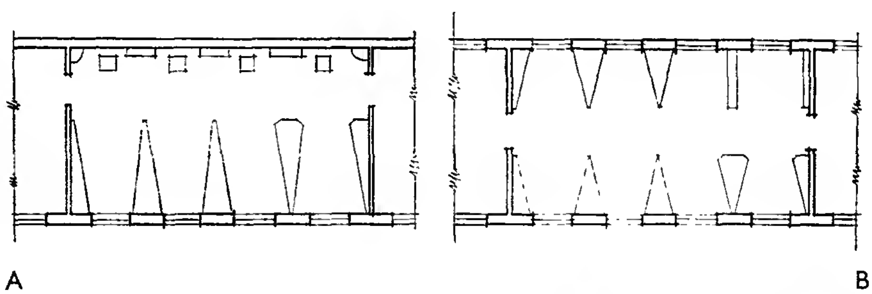



Fig. 5 Galleries: side lighting

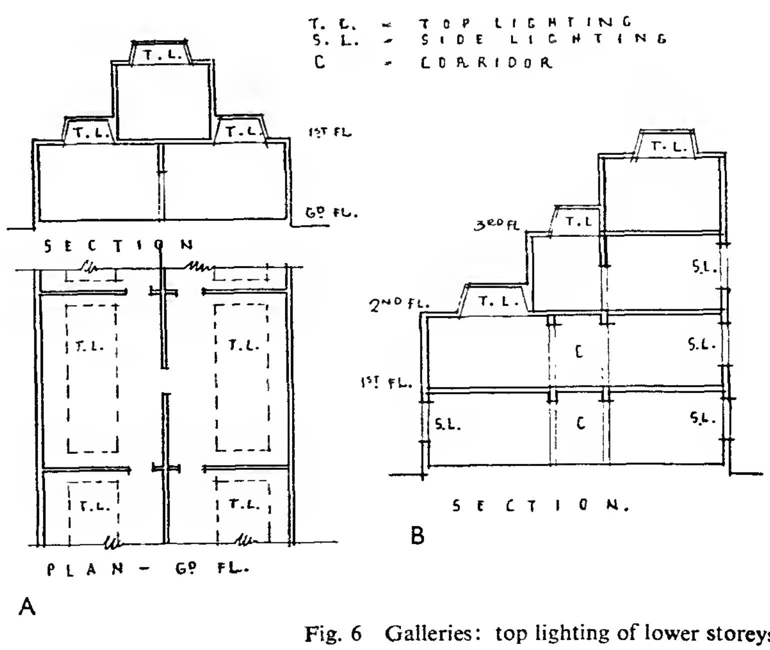



Fig. 6 Galleries: top lighting of lower storeys

on each floor. Side light, and consequently windows, are unnecessary for the topmost storey.

There is a large number of variations of plan and more particularly section, which can be based on the idea of the setting back of upper floors, and Fig. 6 must be considered only as a suggestion and basis for explanation. The criticism that much possible floor area is lost by the setting back of the upper floors may be more than counterbalanced by the gain in more desirable lighting for the floor and wall areas provided.

### Top-lit Galleries

Top light is of the utmost importance for many museums and art galleries, although the light must be controlled to suit the objects to be displayed; for the display of many objects an evenly distributed light over the whole area is all that it is necessary, but for many other objects, and especially for pictures, the light must be directed and controlled in particular ways to provide the right type of light and to eliminate reflections. For the display of pictures the source of light should be limited and so controlled that it is strongest on the parts of the walls which are used for actual display and weakest where the observer stands. The source of light should be behind the observer whenever possible. Much may be achieved by the correct selection of the type of glass to be used for screens or laylights through which the light enters the gallery. The glass may be chosen not only to diffuse and distribute the light evenly, but also to transmit light in a given direction.

Experimental work has been carried out in connection with the lighting of picture galleries by many research workers, but any complete and infallible solution of the problem does not appear yet to have been arrived at.

There are many alternative sections of galleries recommended by different authorities for the lighting of pictures, in addition to the various sections that have been tried in actual buildings; the diagrams have therefore been chosen to serve as a general basis for explanation of different types available and the effect each has on the lighting.

The reflections to be considered are those of the source of light, of other pictures on end walls or opposite walls and of the observer. Direct strong daylight must be avoided on pictures, but at the same time there must not be too great or uneven diminution of light on the pictures.

Fig. 7 illustrates two typical picture gallery sections, both of which may be duplicated side by side if desired, giving two circulation spaces adjoining. Each type shades the spectator from direct light and concentrates the light on a limited portion of the wall only. The spectator is screened from reflections from the light source in each example; as in Type A he is either in the corridor space or, alternatively, adequately screened although actually in front of the source of light, while in Type B the ceiling is so shaped as to achieve the same effect.

In Type B the wall on which the pictures are hung is slightly sloped to avoid still further reflections of the light source from pictures, particularly when glazed; a similar treatment may be provided in Type A.

In Type A the spectator stands in very subdued light, as it is produced by the reflected light from the curved ceiling only and in Type B this source of light is still more reduced. Type A allows the spectator to stand nearer to the picture than Type B without himself being within direct light rays.

The light on walls should be stronger than on the floor, and therefore the angles and sizes of ceiling and lights must be so arranged as to concentrate strong or direct light above the floor level.

Fig. 8 illustrates further important points relating to the sections of galleries with top and clerestory lighting. The important factor is that the angle of reflection is equal to the angle at which the light strikes the object; consequently the angles from the source of light, namely, the top light or clerestory window, must be so arranged that the reflection is not visible to the observer of the object. Fig. 8 shows how different heights of section are necessarily changed with each type of lighting in order to give the same control of reflection. It should be borne in mind that the quantity of light available with an horizontal skylight is greater than when clerestory or a reversed lantern-light is used, but the quality of the light on the objects is usually very much better with the latter types. Fig. 8 A shows that by the use of the inverted lantern-light type of section the galleries do not need to be very high to secure good illumination on objects hung on the walls and, in fact, if the section height is raised, the reflections immediately become troublesome. When a flat laylight is used under a central top light or lantern, the section height must be raised considerably, as shown in Fig. 8 B, to obtain the same angle of light and consequently controlled reflections. If clerestory lighting is to be used without the introduction of laylights which reduce the glass area on the ceiling through which light can pass, the ceiling has to be raised to a very great height, as shown in Fig. 8 C.

Any sections based on clerestory lighting types, such as Fig. 8 C, should have windows on two long sides of the gallery only and not on the end walls. If placed on one end wall, reflections are caused on walls opposite the source of light, and to some extent on side walls. The length of rays from the source of light to the object causes reflections on end walls owing to the increased distance, even when the height of the source of light is controlled to give satisfactory results on side walls.

Fig. 8 is based on permitting the observer to approach to within 6ft. of the object with an eye-line of 6ft. above the floor; it may, therefore, be considered desirable in many schemes to change the angles a little and base them on an eye-point of a smaller minimum distance from the object and a lower height. The farther the eye-point moves away from the object on the wall, the less the likelihood of reflections.

Fig. 9 stresses still further the varying heights of galleries to achieve the same control of reflections, but also illustrates clearly the progress that has been made in the methods of providing light in the galleries. Diagram A shows the general method of lighting which has been widely used; it provides a large amount of light, but much of it falls on the floor and on the observers instead of being directed on to the walls where it is most needed. Further objections to this form of lighting are that the source of light is visible from all parts of the room, that there is excessive glare and considerable height is essential to avoid serious reflections.

Diagram B in Fig. 9 shows ordinary clerestory windows which require, as previously stated, even greater height than the horizontal laylight with a skylight over; this type of lighting is

better than Type A, since the walls receive more light and less is directed on to the floor and spectators.

Diagram C shows a form of lantern-light, but without top or roof glazing; many of the disadvantages of clerestory lighting inherent in Diagram B are avoided, particularly as regards excessive height, although considerable height is still needed to control reflections. In this type the main structural beams usually have to cut across the opening under the light and are visible in the gallery.

Diagram D in Fig. 9, which shows the inverted lantern-light type has various advantages over the other three types shown. Light is more on the objects, spectators are in the shade, there is little glare, all the walls may have direct light since windows at each end of the lantern cannot be seen by spectators and section heights are lower. The diagrams in Fig. 9 are all based on galleries of the same width.

Fig. 10 illustrates an example of a gallery section based on a development of the inverted lantern type. It should be noted that there is a normal outside glazed roof which provides light for the glazed sloping laylight on the gallery ceiling; this laylight is continuous round all the walls of the gallery and concentrates the light on the walls where it is most needed and leaves the spectators in an area lighted by reflected light only and consequently of a lesser intensity than the walls.

Since artificial light is of very great importance in galleries, the design of the installation must be considered in conjunction with the source of natural lighting. If the daylight sources have been designed to provide definite conditions, it is essential that the artificial light should reproduce similar conditions. It is desirable, therefore, that the artificial lighting be placed when possible behind the laylights or lanterns. The section shown in Fig. 10 allows for such an installation to be placed behind the sloping laylights and to be accessible from the false ceiling for maintenance, thus daytime lighting conditions as regards sources of light are almost exactly reproduced. It should be remembered when designing false ceilings, as suggested in Fig. 10 or Fig. 9 D, that the false ceiling must be strong enough to be used as a means of access to clean the insides of the roof lights and laylights and to attend to artificial lighting.

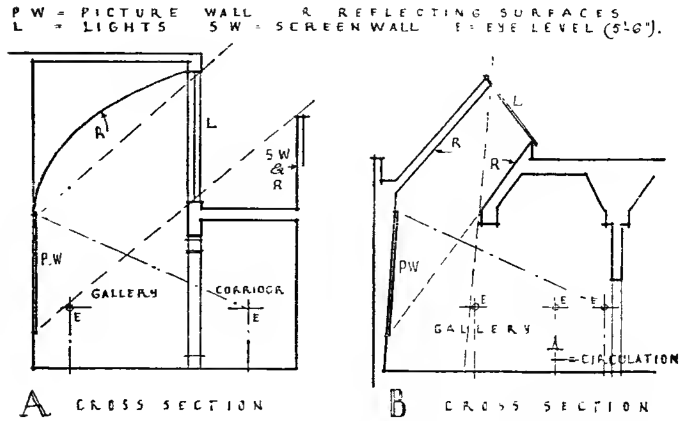



Fig. 7 Picture gallery sections

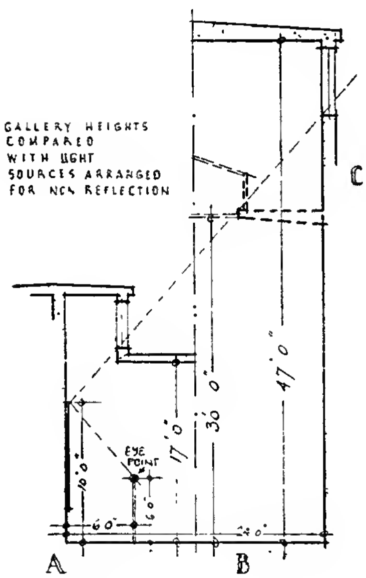



Fig. 8 Galleries with top and clerestory lighting

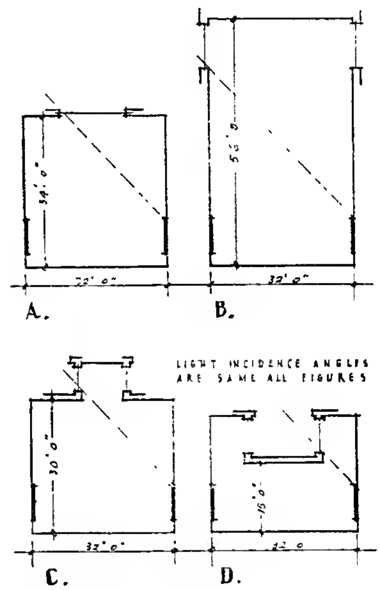



Fig. 9 Light distribution and reflection

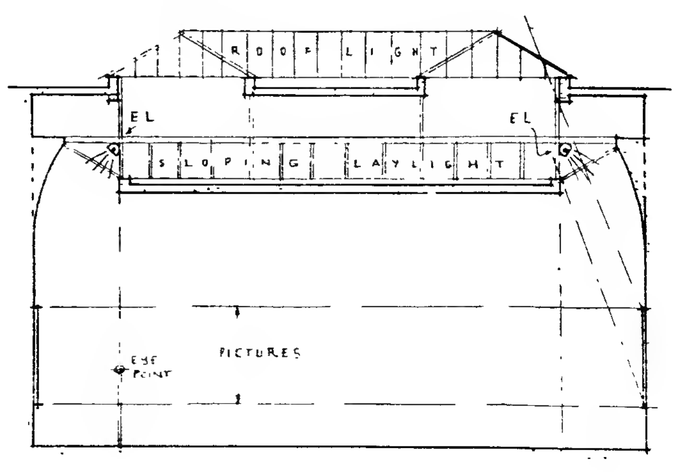



Fig. 10 Picture gallery sections

## TOP-LIT GALLERIES, TEMPORARY EXHIBITIONS, FACILITIES FOR STUDENTS

Galleries to be used for the display of normal museum exhibits, apart from pictures or sculpture, do not need such special consideration from the point of view of lighting, since exhibits are either not placed in cases or are examined by the observer standing close to glazed cases, in such a way that reflections do not cause much inconvenience; in fact, lighting is often installed inside the cases themselves which eliminates any possibility of reflection. Museum galleries may, therefore, be normal side-lighted rooms with windows, or top-lighted with the usual lantern-lights with interior lay-lights on the ceilings. Rooms for such uses do not need great height. Gallery heights should, therefore, be controlled in most instances by floor areas to give pleasant proportions.

### Temporary Exhibitions

When special provision is made for temporary exhibitions—a usual requirement in most museum buildings—it is desirable to have a suite of rooms which includes at least one large and one small gallery. These should be placed near the main entrance hall for the convenience of visitors and to avoid passing through other departments to reach the special display. It is desirable that such galleries be cut off completely so that noise caused by frequent moving of exhibits does not disturb other sections of the museum. It is essential that a goods lift be placed near this suite of galleries for rapid and easy movement of exhibitions. Unpacking and cataloguing rooms should be near the lift and may be placed in a basement or on a lower ground floor, where deliveries may take place.

### Facilities for Students

In most museums and art galleries a number of exhibits is often not normally displayed for reasons of lack of space, or to avoid showing the public too much of any type of object. These "surplus" exhibits are of great importance to museums and particularly to students. Various types of reserve galleries have been tried and each appears to have certain advantages over the others. The important factors seem to be that all exhibits must be easily and quickly accessible and easily handled by students and curators; at the same time, it is essential that desks or working tables should be placed in close proximity for research workers to make notes and write. The type of room and its equipment must necessarily vary considerably according to the type of objects to be stored; ceramics, for instance, need cupboards and shelving, prints are usually kept in flat drawers and pictures and textiles are frequently stored on vertical sliding or swinging sereens.

It is desirable that storage and study rooms be placed adjoining the galleries allotted to each department or section, together with any departmental rooms needed, such as rooms for the curator and his staff. Reserve rooms may either be a suite in a wing or in a block of the building attached to the side of a long gallery, or series of galleries approached from the side of the galleries; or, in a corridor type of circulation, the smaller rooms on the opposite side of the corridor to that occupied by the galleries may be used for these purposes. Alternatively, very wide galleries may be planned with a portion of one side screened off by cases or walls as illustrated in Fig. 11.

Fig. 11 shows a side-lighted main gallery with screens for exhibits near the windows, island cases in the centre of the room and wall cases against the partition separating the reserve rooms. This partition and the cases placed against it need not be more than 9ft. or 10ft. in height, thus allowing some light to reach the storage rooms. When the galleries are on upper floors or where set-backs can take place above the corridor, clerestory lighting over the normal corridor height can be used to provide additional light to storage sections. The reserve rooms in this example are fitted up with cupboards on each wall, excepting in certain portions on one side where writing desks for students are incorporated in the lower part with cupboards above normal headroom height. The depth of the cupboards is mainly dependent on the type of objects to be stored, but for most types of objects suitable for storage in cupboards a depth of 1ft. 6in. to 2ft. 10in. is usually sufficient. The overall width from the partition to the corridor wall can thus be accommodated in about 7ft. 6in. to 9ft.; the space between the faces of the cupboards should not be less than 4ft., so that a person may pass an open door without risk of damage to any object or exhibit he may be handling. The desks should be at least 3ft. long and 2ft. wide, so that exhibits may be placed on them for examination while notes are being made. Doors from the corridor giving immediate access to reserve rooms should not serve as approaches to the galleries, and it may be considered desirable to hang an additional door on the line of the partition separating reserve space and gallery.

Fig. 12 illustrates one method of fitting up reserve rooms which are to house pictures, textiles, wallpapers and similar exhibits which need flat vertical screens as a storage method. The screens may be made of wire mesh to which pictures may be hooked, or wood or wallboard panels to which they may be pinned: the wire screens permit access to the backs of the pictures for examination without their removal from the screen. These screens should be supported from ceiling tracks and, if possible, floor tracks should also be provided, since the screens may be heavily loaded. This screen arrangement permits a large storage space within a comparatively small floor area, and all exhibits are readily accessible for examination. Screens can be the full height of the room and require twice their length plus about 7ft. as space for circulation round the screens when drawn out into position for examination and for writing tables and desks. Good normal side-lighting is necessary, but not special gallery lighting, since, when important examinations are to be carried out, the exhibits may be removed for inspection in concentrated natural or artificial light. The screens should not be placed too close together, as frames may have considerable projection, and a normal spacing of 12in. will usually be found desirable. A flat and specially constructed ceiling for the fixing of the tracks for the screens is needed at the level of the underside of any normal beams.

Fig. 13 illustrates another type of arrangement for study rooms and reserve exhibits. Three levels of storage are provided in the normal height of one exhibition gallery, with access gangways on three sides of small rooms, leaving the centre portion of the room clear for desks or tables at which students may work. The fourth wall may be largely occupied by windows to provide ample light for the whole room. The upper tiers of cupboards

and the access gangways are reached from staircases placed in the depth of two sets of cupboards planned back-to-back. By this arrangement the whole wall areas may be covered with cupboards, all of which are within normal reach, since the gangways limit heights to about 7ft., whereas without the additional or upper tiers, cupboards have to be limited to about the height of the lowest tier, unless steps or ladders are used for access to the stored objects, which is to some extent dangerous. A further advantage of this scheme is the concentration of a large number of stored or reserve objects within very easy reach of a student. The reserve spaces are placed very close to the relevant galleries but at the same time are completely cut off, thus permitting quietness for study.

Fig. 11 Reserve room

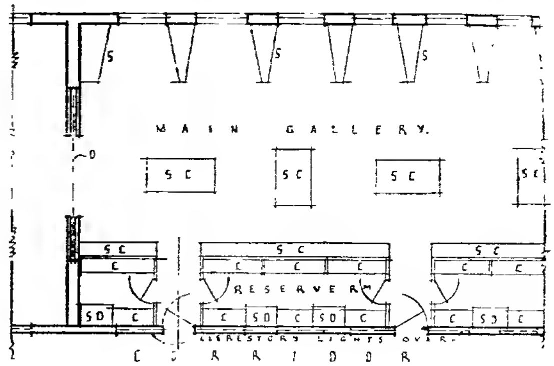
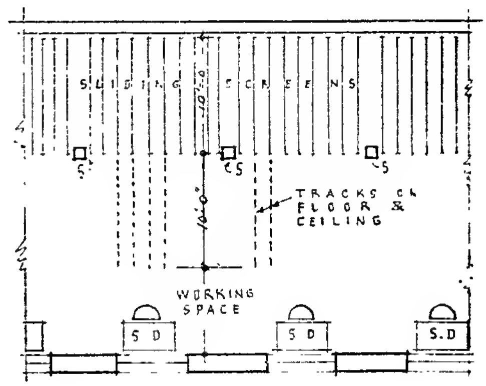



Fig. 12 Reserve room




### Lecture Halls

Provision of a suitable room for public lectures is often required in conjunction with museums and art galleries. Such lecture rooms may be required to seat as many as 500 persons, although generally much smaller rooms are sufficient for the purpose. The rooms should be easily accessible from the main entrance vestibule without visitors having to pass through all the exhibition galleries; a suitable position may often be provided at basement or lower ground floor level approached from staircases leading from the entrance vestibule, thus obviating the necessity of providing special control and cloakrooms. Artificial lighting and ventilation are sufficient, as the rooms are only used from time to time and not by the same persons continuously. An alternative arrangement, although far less satisfactory, is to use a gallery normally used for temporary exhibitions.

The necessary information regarding the planning of seating for rooms of this type, which usually have level floors, is given in the sections on "Schools," "Community Centres" and under Assembly Halls in "Municipal Buildings." If sloping floors are used, it precludes the use of the room for most other purposes, but it may be desirable in some schemes, as, for instance, where scientific demonstrations are likely to be given, to restrict the purpose of the room, introduce a sloping floor with seats in tiers, to

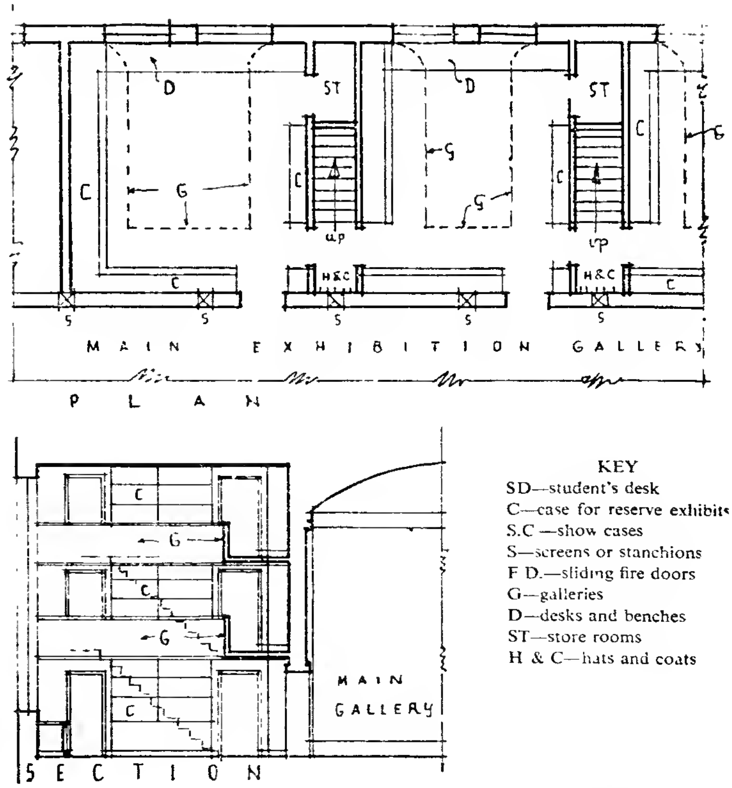



Fig. 13 Reserve rooms

LECTURE HALLS, STAFF ROOMS, STAFF REFRESHMENT ROOMS, PHOTOGRAPHY ROOMS, CLEANERS' ROOMS, PUBLIC ROOMS, SAFEGUARDING EXHIBITS

give a better view of demonstrations, lantern screens, etc. Provision should be made in all lecture rooms of this type for cinematograph projection, which involves special planning of escape to conform to local regulations as described elsewhere. Entrances and exits must also be planned to conform to local regulations controlling buildings used for public entertainment.

**Staff Rooms**

Various rooms are needed for staff and working purposes in addition to those used by the general public. These rooms provide space for receiving, unpacking and cataloguing exhibits, together with workshops for various trades, according to the type of museum, where exhibits may be cleaned and repaired. Such rooms are usually placed in basements or on lower ground floors, but when possible, reasonably good daylight should be provided, especially in rooms used for clerical work or for crafts involving very " close " work.

Offices are needed for officials and their staffs for the general administration of the whole museum and often for each section or department. General management offices are usually grouped together, but departmental offices are better if planned in conjunction with the galleries of the department, so that officials are near the exhibits in their charge. Lavatory facilities should adjoin departmental offices.

A board room or committee room is sometimes needed and often this room, together with general administration rooms, is grouped together with a separate entrance to avoid having to pass through museum galleries to reach the administration offices. These offices are normal office rooms for information on which *see* the section on " Office Buildings."

Rooms must be set aside as locker rooms for the uniformed staff, such as porters and custodians, who generally arrive at the building in ordinary clothes and keep uniforms on the premises; these rooms are planned as normal locker rooms. Lavatory facilities for staff use should be grouped with the locker rooms and workshops, separate provision being made for each type of staff as necessary.

**Staff Refreshment Rooms**

Mess rooms should be provided for porter, custodian and workshop staffs, and when there is a public restaurant or tea-room on the premises, these rooms should be planned so that they may be provided with shared kitchen facilities and sometimes for " cafeteria " type of service.

**Photography Rooms**

A special group of rooms is often needed for photography in conjunction with the receiving room and workshops, as in many museums all exhibits are photographed for record purposes; the rooms should comprise a studio equipped with adjustable lighting, a dark-room adjoining, and a negative store. Special fire protection should be provided for the latter as the negatives are often irreplaceable, as, for instance, photographs taken before renovations or restorations are made.

**Cleaners' Rooms**

Cleaners' rooms are essential on each floor and in large museums duplication may be necessary. These rooms should be placed in unimportant positions, possibly grouped with the administration rooms of each department. Vacuum cleaners and power installations for floor-polishing machines are needed as large areas have to be cleaned daily within comparatively short periods when the museum is closed to the public early in the morning and late in the afternoon.

**Public Rooms**

In addition to cloakrooms, lavatories, catalogue and book stalls already mentioned, rest-rooms and a restaurant are often needed in museums. The official and office staff may need a restaurant also, which should be planned to be served from the same kitchen. A restaurant based on the " cafeteria " type of service may often be advisable, particularly to reduce the necessary staff to a minimum.

**Safeguarding Exhibits**

In general, museum authorities agree that the best safeguard for exhibits, both by day and night, is suitable and adequate patrol by custodians. Although in some rooms it may be thought necessary or desirable to install metal sliding or collapsible shutters and steel entrance doors, proof to a certain extent against theft, these precautions are generally quite limited in extent. The chief consideration is protection from fire and the provision of fire-fighting materials for extinguishing fires. To this end, the buildings should be, in structure and all furnishings and fittings, as fire-resisting as possible, with hand and trolley chemical extinguishers dispersed about the building on some properly planned and organized method. Fire mains (either dry or wet) with hose-boxes, etc., should be, in the main, kept to positions adjacent to the principal vertical circulations, where would also be located fire alarms and custodians' telephone-boxes or instruments.

Special boxes or recesses for custodians' day-time use are undesirable as it is best that the men should patrol or sit in the actual galleries under their care. At night, custodians should be able to patrol the entire building on some pre-arranged circuit or series of circuits at set intervals, and to this end galleries and other rooms should be planned with entrances and exits which permit this to be done. The positions for clock-recording instruments should be arranged in inconspicuous places. Certain rooms containing particularly precious exhibits (jewellery, etc.) may be required to be locked during the night and such rooms should be fitted with strong gates or with small shutters in the doors so that the patrol may examine the room without entering it; night switches should, for this purpose, be placed outside the doors.

## Introduction

There are three main types of libraries; first, the private library serving only its owner who may be either an individual or a single commercial concern; secondly, the specialist library which is devoted mainly to branches of one subject, as those attached to learned societies and faculties in a university and, thirdly, public and semi-public libraries, such as, in the former category, the town and county library and, in the latter, school and university libraries. Each serves one or more of the main purposes of a library which may be roughly subdivided as follows: reference, newspapers and periodicals, lending and children's departments. Some libraries incorporate all sections.

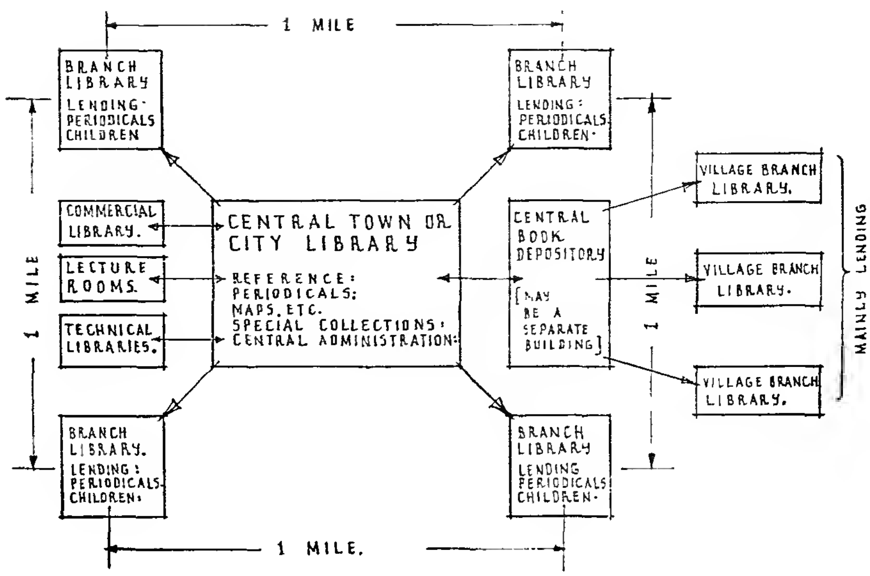



Fig. 1 Organization diagram

Fig. 1 is a diagrammatic attempt to illustrate the main principles of the library system which may be set up by a county authority or municipality. The central library is primarily the headquarters of the system and serves the public through branch libraries, except in certain departments. The main reference library and any special libraries form the central library, together with the stack and main work rooms which issue to the branch libraries. A small lending library may be attached to the central library but this is dependent on the distribution of the branches in relation to the population. Special collections, maps and matter of local interest, together with a lecture room are usually attached to the central building.

The main stack rooms serving branches may or may not form part of the central library. In larger towns and cities economies may result from the attachment, due to saving in administration costs, but the site cost may be too great to justify the provision in a central locality of what is virtually warehousing accommodation.

In county organizations books are mainly or even entirely distributed to the public by means of the town and village branches in outlying areas, the central library thus being only a warehouse, together with the necessary rooms for the staff to look after and distribute the books.

Branch libraries are placed according to the situation and density of the population to be served, and are dependent to some extent on transport facilities. It is suggested by one authority they should not be more than one mile apart in evenly and well-populated areas. The branch library is mainly concerned with the lending of books to be read elsewhere and has only a few books of reference. Some branches develop beyond the lending library and require news-rooms, children's departments and a lecture room.

The smallest type of library is that which is termed a " delivery station," which is generally a room or a few shelves in a shop or institution in a sparsely populated or newly developed district, the books being supplied from the central depository.

In this section it is not proposed to discuss the planning of national or exceptionally large libraries such as that attached to the British Museum, but to discuss mainly libraries for the use of the general public.

## Book Storage

The design of libraries is largely dependent on the sizes and positioning of bookcases, book stacks and periodical stands, etc.

Since, however, storage of books is a requirement of many types of building, details of such items are given in Part 1: Storage.

## The Site

The site should be chosen to give the maximum of quiet but at the same time should be conveniently situated in relation to the population it is to serve. Good light and ample surrounding air-space are essential and consequently sites congested by surrounding buildings should be avoided if possible. Space for extension is necessary unless a new building is large enough to cater for the probable needs of 30 or 40 years ahead. If the site is bounded by a road carrying heavy traffic it is important that the building be set back from it. When there is a children's section attached to a library it is desirable that access should not be from a road carrying heavy traffic.

Orientation of the building is not of great importance although sunshine is more desirable in some rooms than others. Strong sunlight is not desirable in stack rooms (where it fades bindings) nor in work rooms, but its presence in periodical and newspaper rooms is pleasant.

## BRANCH LIBRARY: DISPOSITION OF ROOMS, ENTRANCE, PERIODICAL ROOM

### The Branch Library

Fig. 2 is diagrammatic of the general relationship of various rooms to each other. Additional rooms sometimes may be required, such as rooms for special collections. A lecture room and study rooms may be needed but are not part of the essential space needed in most schemes.

The rooms to which most of the public needs access should be approached directly from the entrance hall and should be on the entrance floor level, while rooms less often visited, such as reference, study and lecture rooms may be placed elsewhere or on other floors. Each floor must be on one continuous level, and staircases should be placed so that they may be controlled easily. Exits from all public rooms must be planned to be under observation by the staff. It is also desirable that all or at least several of the public rooms be supervised by one member of the staff to avoid overseers or attendants in each room which is only necessary in exceptionally large schemes. Rooms must not, however, act as thoroughfares from one to another. The control point of the lending library being placed as suggested on Fig. 2 permits the attendant to control the entrance to the building and the doors to the public rooms.

The planning of the lending library is dependent on the system adopted for issuing books, but for ordinary public libraries the open-access system is being almost universally used, and Fig. 2 is based on this system. If a reference room is not provided at the branch library the few general reference books required are placed in one of the following positions: the periodical room, a study room, near or in the staff enclosure controlling the lending library. Working rooms for staff should not be easily accessible to the public, but easy access to any stack rooms is essential. The staff rooms generally needed are a librarian's private room, staff work room, cataloguing and filing room, cloakroom and a small mess room. Other rooms are needed for general storage, heating and for cleaners.

Many public libraries do not seem to provide lavatories and W.C. accommodation for the use of the public, but such provision seems essential and it is desirable that separate accommodation be attached to children's rooms.

In some branch libraries provision is made for a resident caretaker who is given a flat either in semi-basement or on an upper floor, but in the majority of branches such quarters are not provided. Cleaners' rooms are necessary on each floor level.

A large number of branch libraries are single-storey buildings with a basement occupying part or the whole of the area under the ground floor. A few, however, are planned as two-storey buildings, especially when a lecture room forms part of the accommodation; this room is often placed on the first floor.

### Disposition of Rooms

When a branch library is a two-storeyed building it is desirable that the children's rooms be at ground-floor level. It is more satisfactory to place the reading room and periodical room on the ground floor rather than on the first floor and the lending library on the upper floor if there is no space for it on the ground floor. Reference rooms, if provided, may also be on the upper level. It is wise, as a general rule, to lift the ground floor well above the surrounding ground level so that the basement may have good light and ample ventilation, especially if used for work rooms or book storage.

### Entrance

The entrance should be moderately spacious, but not so large that it encourages people to stand about. The space should provide for direct access to the several rooms adjoining. The main staircase, if there is an upper floor, should begin in view of the attendant in charge. Some wall space is generally required for display of notices and announcements and the display should form part of the general scheme of decoration. In many libraries, to reduce the staff controlling the various rooms, walls between the entrance hall and rooms adjoining are formed with glazed screens, which should be more in the nature of large windows rather than complete screens in order to avoid an excessively "institutional" character.

A proper vestibule or daylight lobby is essential at the entrance so that the main hall is neither cold, draughty nor dark.

### Periodical Room

In most branch libraries the general reading and periodical rooms are combined, therefore the room has to provide accommodation at tables for those reading magazines and standing accommodation for newspaper readers. In larger libraries newspapers and other periodicals are sometimes in separate rooms.

Tables are generally planned to seat four, six or eight persons each. It is probably more satisfactory, if space permits, to use tables seating four persons only. These tables may either be designed to seat two persons on each of the two long sides or one on each side of a square table. Circular, hexagonal and octagonal-shaped tables are also used occasionally to break up the evenness of table-spacing in the room. Tables for periodical rooms often have a central rack or division with each reader's space marked for a particular paper which is usually fixed by some method to the table. Other libraries have flat or slightly sloping table tops and have the magazines kept in racks placed about the room or fixed to the walls from which readers take the paper required, go to a table and replace the paper in the rack after use. Tables are frequently made too small for comfort; 2ft. 6in. run of table per person should be used as a general basis, with a possible reduction to 2ft. for the places at table ends, as indicated in Fig. 3. Tables are generally 3ft. wide and are better if wider, especially when there is a central division or rack.

Fig. 3 also indicates the minimum spacing of tables in relation to walls and other tables. At least 5ft. or, better, a minimum of 6ft. should be allowed between tables with movable chairs and between tables and walls where there are chairs at the sides or ends of the table or wall bookcases. When there are neither chairs nor bookcases between the walls and tables the passage way may be reduced to a minimum width of 3ft.

### Chairs

Many types of chairs are used for libraries, but generally armchairs are to be preferred. They are, however, more costly than small chairs. Many chairs specially made for library uses have rubber or leather pads or domes

of silence on the legs to reduce noise. The design of chairs makes a considerable difference to the general appearance of rooms and many libraries suffer from poorly selected chairs. Ordinary movable chairs are preferred to the fixed varieties used in some libraries. Wooden chair seats are usual in periodical rooms to discourage "loafers," but seem a disadvantage to the genuine user.

### Newspaper Room

The display of daily and weekly newspapers is general in most branch libraries. The most satisfactory method seems to be upon wall stands rather than on island stands as supervision by the staff is made easier and the room has a less crowded appearance. Smaller libraries often combine newspapers with periodicals, with the walls devoted to newspaper stands and the centre of the room to periodical reading tables. (For details of periodical and newspaper stands, *see* Part 1: Storage.)

### Reference Books in Branch Libraries

The few general reference books which are required in a branch library are usually placed in a special bookcase in the reading or lending room or occasionally in a case forming part of the staff working-space.

Ample space should be given round the reference case, and it is wise to plan a table or a wide shelf near it as some of the books, such as directories and dictionaries, are too heavy to hold with comfort.

Other equipment of periodical rooms consists of lists of papers taken and sundry notices for the information of visitors. Such lists and notices should have permanent positions in fixed frames incorporated in the general decorative scheme, but frames to contain slips or notices must be capable of rapid and easy changing.

### Children's Department

It is desirable that separate accommodation should be provided for the use of children in branch libraries. This department should either have a separate entrance or access on one side

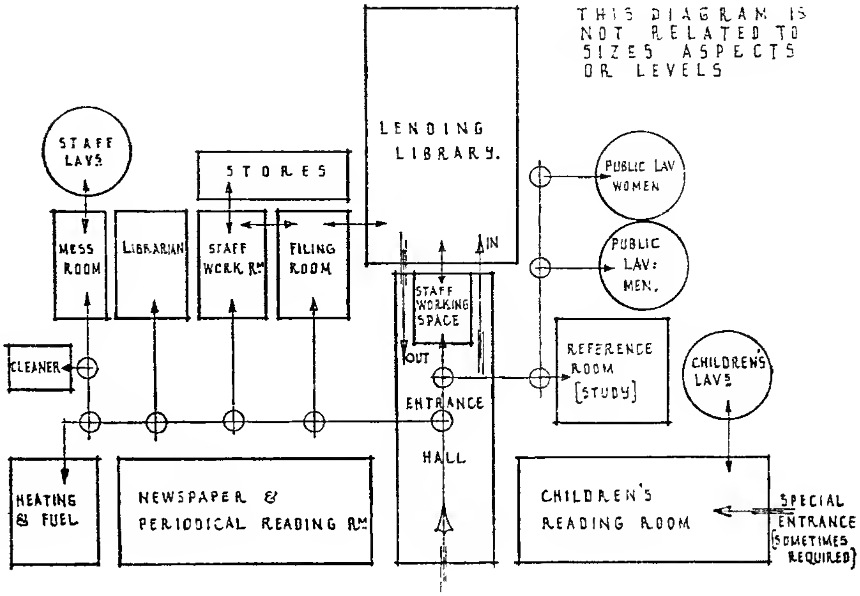



Fig. 2 Plan analysis: the branch library

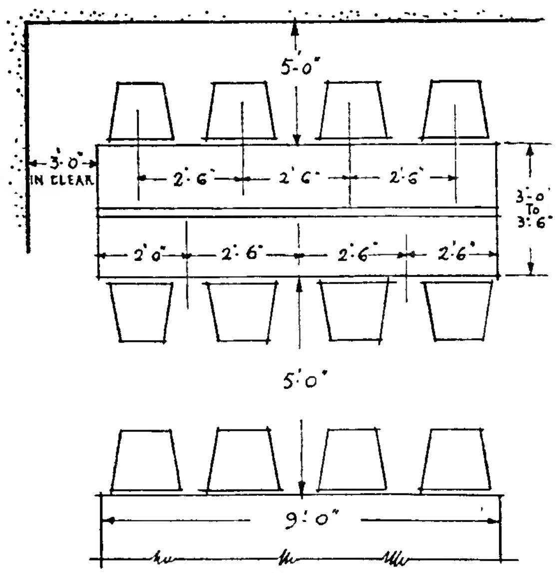



Fig. 3 Spacing of tables in periodical rooms (minimum sizes)

of the main entrance hall. It is desirable to provide lavatory accommodation for children and this should be near the entrance and in consequence near the staff desk.

The ages of the children to be considered vary from about six to twelve or fourteen years, dependent on the age at which they are allowed into the adults' library. In view of the ages of the children all fittings and furniture must be designed in miniature.

The full accommodation of a children's department should consist of a lending library, a reading room and study or talk corners where story telling and readings may take place. A staff desk is required in this department as the constant attention of at least one person is necessary. The staff desk does not need to be elaborate, and it should not be in the nature of a rigid enclosure. The study or talks corner should open off the main room in the form of a large recess. Wall space is desirable for a blackboard, diagrams and pictures, while the furniture should consist of a number of chairs which can be grouped round a speaker in an informal manner. Some children's libraries do not have a lending section as home reading is dealt with through school libraries which may form part of the municipal or county library system.

### Children's Reading Room

This is usually a large room with wall bookcases on two or three sides and one wall left for use as a lecture screen.

### Lending Department

The lending library is generally the most important section of a branch library. It may be a self-contained unit or may be fed from the parent central library and its stack rooms. The lending department planning is largely dependent on the adoption of open or of closed access. The latter system is now little used in new libraries.

The difference in the systems alters planning considerably, as, if the public is to have access to the shelving, more space is required between shelving. Also a layout of bookcases is needed that permits of constant supervision by the staff from the working spaces provided for it. The closed access system requires a much larger public counter space where books are handed in and issued and also for book " in " and " out " indicators; though, on the other hand, the actual shelving is arranged much closer together, on stack room lines (*vide infra*), as the staff only have access thereto.

Fig. 4 shows in diagrammatic form the essential circulations required for an open-access lending library. The reader approaches the room from the entrance hall by passing on one side of the staff enclosure where returned books, and fines, etc., are dealt with. At the end of the staff enclosure or in a separate fitting are placed catalogues for reference. The reader then circulates around the bookcases and selects books required and passes out on the opposite side of the staff enclosure where the borrowed books are checked and readers' cards collected. The bookcases are frequently arranged (as shown on the figure) radiating from the staff enclosure in order that all shelves and spaces between may be under supervision by the staff on duty in the control enclosure. This radiating layout is uneconomical in space, but reduces the cost of supervision. In large schemes extra bookcases may be introduced as the distance from the staff enclosure increases, but at least 6ft. width of gangway is needed between them. The bookcases may be placed only 3ft. apart in closed access libraries where the public do not circulate among the book stacks and the radiating layout becomes unnecessary.

The area of an open-access lending library may be roughly based on an allowance of 20sq. ft. per person of the maximum number likely to be present at any one time, inclusive of gangways and book stacks.

It is essential that the lending library should have good lighting in every part of the room, so that visitors may read easily the titles of books on the shelves. The rooms are generally of fairly large dimensions and rather square in shape, and therefore top-lighting often provides the most satisfactory solution, especially as there may be wall cases which would be below windows and therefore overshadowed. In addition, there may be island cases which materially obstruct side-lighting, if the latter only is available.

It is an advantage to have easy access from the lending library to work rooms where ingoing and outgoing books from and to the central library and repair rooms are handled.

### Staff Enclosure

Lending library layout centres round the staff enclosure from which the department is controlled. The size is entirely dependent on the anticipated number of users of the library at any one time and, therefore, the number of staff that will be required to work within it. In small branch libraries one person can control both incoming and outgoing readers, but in larger libraries at least two members of the staff are needed within the same enclosure and often more in very busy branches. The staff enclosure may be arranged in a variety of ways. It is usual to let the public pass on each side of the enclosure, but in some large libraries the two public ways are placed together, with the staff desks on each side. Alternatively, the entrance and exit desks and passage ways are quite separate in different parts of the room, though this layout is seldom adopted as communication between members of the staff is inconvenient. Access ways for borrowers should be about 2ft. 6in. wide between the barriers. Fig. 5 illustrates a typical layout of a staff enclosure with the passage ways on each side. The enclosure is placed at the entrance to the room and it is consequently necessary to have sufficient space in the main entrance hall or vestibule for borrowers to form a queue during busy periods.

Fig. 6 illustrates a similar layout, but the staff enclosure is placed almost centrally in the library and the bookcases are arranged on a star-shaped plan. This system places the staff in a better position in relation to the book stacks and for central control and is, in addition, less draughty. Barriers are needed in the room to divide the passage ways from bookshelves, but these form convenient waiting spaces for the staff desk. This placing of the staff enclosure does, however, interrupt easy circulation of borrowers passing from the front bookshelves on one side of the room to those in a similar position on the other side. Also, if visitors making inquiries have to go to the staff enclosure in the type shown in Fig. 5, they do not have to enter the library proper as an inquiry

hatch or counter may be arranged directly into the hall. In the type shown by Fig. 6, however, inquirers have to mix with the queue of book borrowers, with risk of some confusion during busy periods.

Fig. 7 illustrates the divided staff enclosure type of layout with the passage ways for borrowers placed centrally. This system is only suitable for very large libraries, as in smaller branches the more limited staff requires the easiest facilities for communicating between the incoming and outgoing sides.

The general layout of the staff enclosure has been fairly well standardized and varies chiefly in accordance with the number of staff to be accommodated. The end of the enclosure facing the entrance is generally used for inquiries, voucher cards, readers' tickets, register of borrowers, etc., specially shaped drawers or receptacles being provided for each purpose in order that everything required by the staff should be available with the minimum loss of time. The counter on the "in" side has to provide spaces for the "charging" trays which are sometimes sunk in the counter-top with a slide to cover them when not in use, or else the trays are arranged as drawers and placed on the counter when required for use. The bottoms of the trays are often sloped in order that the cards at the back of the trays should be easily readable. A drawer is generally provided for cash with the usual "till" bowls for cash and divisions for notes, etc.; this drawer is generally placed in the centre of the fitting with a knee-hole space below it so that the member of the staff may be comfortably seated. It is usual to make the whole of the counter-top (at writing table height-level) clear, and therefore available for the "charging" trays. The whole of the fitting below this counter-top is fitted with shelving or bins to provide temporary accommodation for the return books until they can be replaced on the library shelves. These bins or shelves are often arranged so that the books may be roughly classified as an aid to the rapid replacement in their proper places.

The wicket gates, when used, are frequently operated by a push-bar placed at the top edge of the counter or alternatively with a foot-treadle similar to that used for a turnstile. If operated by the push-bar, the assistant

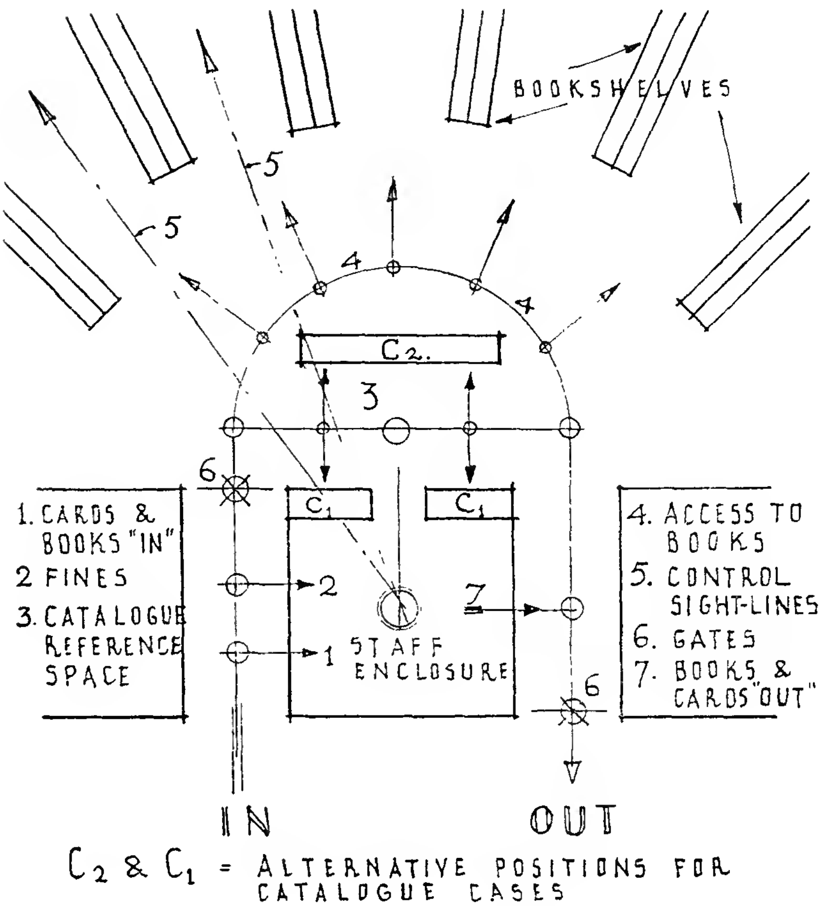



Fig. 4 The lending department

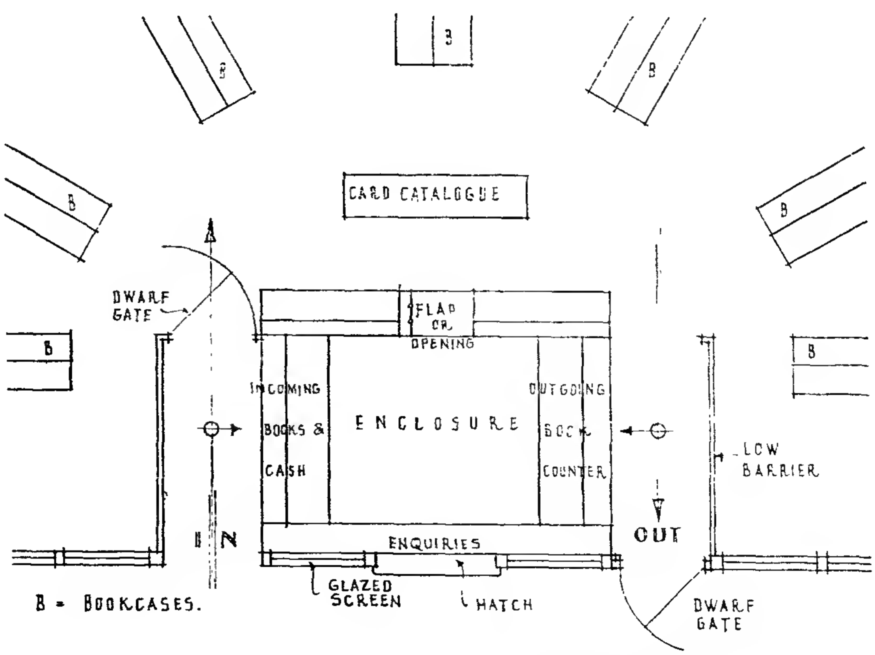



Fig. 5 The lending department: staff enclosure

in charge may press any part of the bar and does not have to reach for a single knob or push-button. The end of the enclosure opposite that used for inquiries is usually left open for staff access to the library or it may be closed with a flap counter-top.

The counter on the " exit " side is somewhat similar to that on the " entrance " side, excepting that the shelving is used for other purposes, such as stationery storage, bins for books withdrawn for repairs. It is usual to have a piece of plate glass on the counter or an entire glass-covered counter-top to prevent staining by dating stamps. The issue trays may again be placed on the counter-top or sunk into it.

In very small schemes one assistant may be able to control both " in " and " out " borrowers by having a narrow enclosure, both counters of which are within reach by making a half-turn on a swivel chair; the total space required for such an enclosure would be about 7ft. wide and a similar length. Counters are normally about 2ft. wide and at least 5ft. 6in. apart, if two persons are to work back to back. Counters are usually 3ft. or 3ft. 3in. high with the back or screen raised a further 9in. to 12in., at which level a shelf for the use of borrowers is placed. This shelf should be about 6in. wide. An average overall length of the counters for an average-sized library is about 10ft.

These staff enclosures have become standardized by several makers specializing in equipment for use in the ordinary branch library, although many librarians prefer to have specially designed fittings to suit their own particular methods and theories of the handling of the book delivery system. Although the arrangement and layout of the contents of the fittings are standardized in size and shape, there is no reason why their general appearance should not be changed to suit variations in general design of, and to be in harmony with, the room. There seems to be a tendency to accept standardized designs and materials, which are not always suitable in all cases, whereas better design, workmanship and materials would not add greatly to the cost and might even better withstand wear and tear, in addition to making for more attractive appearance of many libraries. This point may receive particular stress by a detailed examination of some of the

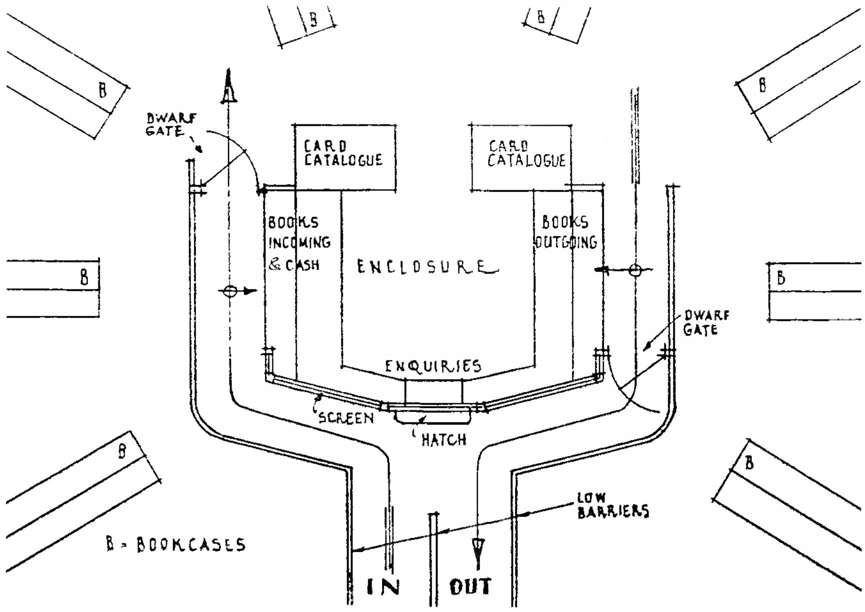



Fig. 6 Lending department: staff enclosure

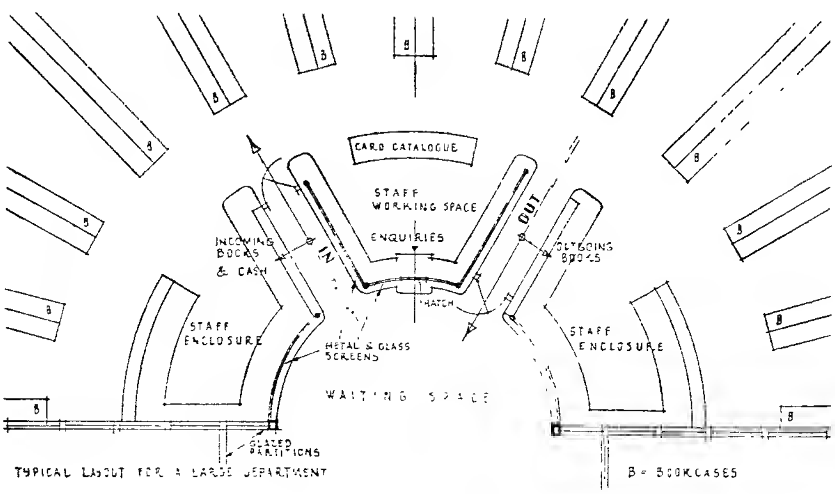



Fig. 7 Lending department: staff enclosure

better public and institutional libraries.

To eliminate to some extent the discomfort of draughts due to placing of the staff enclosure to permit of supervision, the enclosure is surrounded by glazed partitions about 7ft. high. However, in recent schemes, by the planning of proper cut-off lobbies at main entrances and by general and well-planned use of central heating, these screens have mainly been rendered unnecessary.

### Card Catalogue

Smooth working is greatly dependent on efficient cataloguing of books and on some form of guide to the books on the shelves.

### Plan Display Tables

Many libraries use a 3ft. high plan display table to indicate to users the general placing of subjects in the shelves. This fitting sometimes consists of a plan on a table with a slightly sloping top; the plan is usually covered with glass. Other libraries incorporate in the fitting a subject index by placing reading slopes on one or both sides of the table top, to which the subject index is attached. It is essential that card catalogue fittings and plan display cards have ample clear space around them and good light both natural and artificial.

### Work Rooms

The amount of working space required for staff use varies very much, as in some systems the branch library is self-contained and in others the majority of the work is done at the central library. The chief librarian is usually given a private office adjoining the public rooms and it is desirable to provide at least one general work room for cataloguing new books, and dealing with books arriving from and returning to the central library. If there are several members of the staff, a common room is desirable, together with cloakrooms and lavatories for each sex. A cleaners' store, boiler-room and fuel stores may be placed in the basement.

### Lecture Rooms

Many branch libraries have a lecture room attached; this may conveniently be placed on an upper floor, approached from the main entrance hall so that public rooms of the library may be locked off and the lecture room circulation be left open.

The seating normally used for public halls is usual. Sloping floors are seldom used; though a great asset for purely lecture purposes, they prevent the use of the room for special displays of pictures, local exhibitions, etc.

Provision for a cinematograph and lantern should be made. This, if " non-flam " films are not used, involves special planning required under the Cinematograph Act and various regulations issued thereunder as previously described in other sections. Seating is discussed in the sections " Municipal Buildings " and " Community Centres." Planning is, so far as seating, exits and staircases are concerned, the same as for all places of public entertainment. In the design of a lecture room provision should be made for a blackboard, a projection screen and a platform. There should be a proper communication system between the platform and the projection box and a screened reading light. In some library lecture rooms provision has been made for technical demonstrations which need supplies of gas, electricity and water. Occasionally the platform is made sufficiently large for small musical performances such as concerts of chamber music and often, it may be, for play-readings. It is not usual to provide any elaborate stage equipment but a system of curtains is sometimes installed. At least one retiring room and preferably two, with lavatory accommodation, are needed in connection with the platform.

## CENTRAL LIBRARY: GENERAL, REFERENCE ROOMS

### General

A central library may serve as the chief reference library; as a lending library it may serve the needs of the part of the town in which it is situated; also it may serve as the central depôt from which the branch libraries are supplied. This last may be in a separate building on the outskirts of the town where land values are less costly.

The main room of a central library is the reference library to which are attached large stacks for its service. Special collections belonging to the town are generally housed at the central library, as well as collections of local material, maps, music, manuscripts and rare book rooms, commercial and technical libraries. Provision generally has to be made for newspapers, periodical reading rooms, as well as stack rooms for the storage of back numbers of newspapers and periodicals. A lecture room is a necessity.

Large staff accommodation is required for the administration of the whole library system, as well as work rooms for the staff of the central library itself.

Rooms are needed for such activities as binding, cataloguing, book purchase, filing and records, as well as offices for the administrative staff, and a committee room. Fig. 8 illustrates diagrammatically the essential relationships of various rooms of a central library and its main circulations.

The reference room should be the focal point of the scheme, but various subsidiary libraries should be possible to approach without passing through the main reference library. The general inquiry desk should control all persons entering the public parts of the building. The main catalogue which requires a large area should be readily accessible to all users of the reference room. The public does not enter the stack rooms of the reference libraries. The periodical and children's reading rooms should be approached from the main entrance near the doors, or by separate entrances, in order to prevent disturbance of reference rooms. Lavatories should be provided for general public, for children near the children's room and for staff near their mess or common room.

Lavatories for the public should be placed so as to be easily available to the lecture rooms. Living quarters for a residential caretaker are often provided.

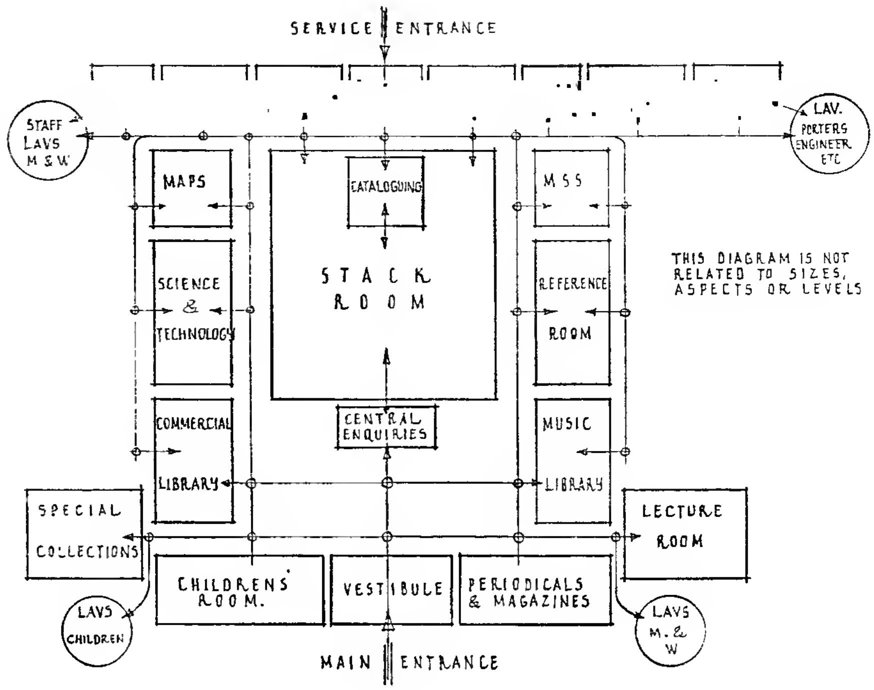



Fig. 8 Central library: plan analysis

### The Reference Room

The reference room is sometimes used partly for book storage, but in some libraries no shelves are placed in the room. The majority of libraries, however, rely to some extent on open access to commonly used books and these may well be placed in the reading room. Some libraries depend on open access throughout except for a limited stock consisting of more valuable possessions; in such libraries the walls are lined with shelves, and have cases projecting into the room forming alcoves. The reference library is essentially a place for study and the alcove system is ideal except in libraries where there is a considerable amount of rapid reference, when the large open room is perhaps better. A combination of the two types may be regarded as the most satisfactory layout of all, as it provides facilities both for the student reading at length in the alcoves and the reader making quick references.

Control by a member of the staff to check readers' cards, etc., is required at the entrance to the reference room, but in smaller libraries control of the room is from the book-issuing desk. With the alcove system it is difficult or impossible to plan the staff desk to have visual control of the whole room.

The public is seldom permitted to enter stack rooms; so that, if open access is required to any extent, the shelving must be placed in the reading room itself. If the public had access to stack rooms, much more generous spacing of stacks would be necessary than that usually adopted. Ease of access for the staff from stack rooms to reading room is the most important factor of the plan. The layout of a reference room depends on table spacing, which in its turn is dependent on the number of persons seated at each table. It is now becoming general for these tables to seat four persons, two on each side, but it is better to have tables seating two persons only, one on each side, to give greater privacy. The older libraries use long tables seating eight or ten readers on each side, with a central screen dividing readers on either side and sometimes low screens or divisions between each reader. The latter divisions give some privacy and ensure to each reader a fixed amount of table space. It is

usual to allow about 6sq. ft. of table space per reader and a slight increase in area is advantageous for students who may require to refer to several books at one time, in addition to writing-space, etc.

### Stack Rooms

Stack rooms must have rapid communication between the reference library staff and any book in the library stock.

The best position for a stack room appears to be immediately adjoining the reference room and at the same level, with " in-and-out " circulation by separate doors to avoid members of the staff or book trolleys having to pass one another in doorways. However, in most central libraries or important reference libraries sufficient storage space on one floor is found to be impossible and therefore a system of rapid and adequate lift service is essential between storage levels and the reading room. Lifts are operated either electrically or by hand, according to the height to be travelled and the anticipated time to be allowed for the handling of books; small cars are generally used, having a clear area of about 16in. by 20in., but it is an advantage to be able to use some or all lifts to transport loaded book trolleys.

### Book Stacks

It is general practice for stacks to be approximately 7ft. 6in. high; this gives access to all books without steps or ladders. The stacks are superimposed one on another, with a light flooring of stone, marble, glass or steel at each 7ft. 6in. of height and the stacks are generally of metal construction. A wire mesh division between back to back bookcases allows air circulation and prevents books being pushed back into the wrong shelves. (*See also* Part 1: Storage.)

Staircases leading from one stack level to another should have a width of at least 30in., or, if spirally constructed, a well of 4ft. 3in. overall diameter.

Floors to the various levels of the stacks can generally be accommodated in an overall depth of 4½in. Provision must be made for continuous ventilation and movement of air to all parts of the stack room and for circulation of heat. The relative merits of the various materials for the intermediate decks in stack rooms are not easily assessed. The most satisfactory appears to be rubber or cork on a thin concrete slab. White marble seems to be one of the most generally used, but it is difficult to clean, and expensive, but reflects light better than most other materials. Thick glass is slippery and therefore dangerous, also noisy, but it does transmit some light from one level to another. Cast iron is cheap but very noisy. Slate is cheap, not so noisy as cast iron, but difficult to clean and does not reflect light. Hard wood is, in many other respects, the most satisfactory.

The stack room must have adequate artificial light for working purposes with lamps in the narrower aisles about 6ft. apart and in wider aisles 12ft. apart. The lights are controlled by local switches near each set of cases.

### Galleries

Many reference rooms have one or more galleries round the room in order to utilize upper wall spaces for book storage, particularly where the reference room is of great height owing to its large area. The lowest gallery should be placed at such a level as to leave at least 8ft. clear between the floor and the underside of the gallery; if more than one gallery is used there should be a minimum height of 7ft. 6in. from the floor of one gallery to the floor of the next to permit the installation of standard bookcases. Many librarians do not like working galleries in reference rooms and the gallery shelves are then usually reserved for the storage of little-used books, but this seems to be unnecessarily wasteful of useful space in the building. The gallery system may be extended from mere book storage space to working galleries with reading tables, or even to an alcove system over alcoves on the lower level. Fig. 9 illustrates some possibilities in gallery planning. Type A shows the simplest form with a gangway wide enough for circulation, with bookcases lining the walls; these gangways should be at least 3ft. 6in. and preferably 4ft. wide in the clear, to allow convenient movement of book trolleys. The floors should be of fire-resisting material covered with wood, rubber or linoleum, the latter two being better for reducing noise. Type B shows a gallery of greater projection and not of cantilever construction. This type is designed to accommodate reading tables so that students may work in close proximity to the books to which they wish to refer. The tables are on the outside of the gallery and lit from top lights over the central part of the room, thus overcoming the necessity of providing windows on the outside walls of the room, impossible in many schemes. An allowance of 2ft. 6in. of space is made for the tables, which may be single or dual (in the latter the readers are placed face to face) and an allowance of 3ft. is made for the gangway, which is less than in Type A, as book trolleys may be turned between tables. The elimination of windows permits the whole wall area to be used for book storage. The placing of the tables on the outside of the galleries makes supervision from the lower floor easier and does not destroy wall bookcase space. If this scheme is adopted, bookcases projecting from the walls may be used on the lower floor, thus dividing the area below the gallery into alcoves. If the projection of the gallery is made 6ft. from the front of the wall bookcases, two standard 3ft. wide book stacks may be used instead of special-sized cases. Alcove tables on the lower floor should be placed directly under the gallery tables to receive daylight from the top lights and to allow circulation space round tables for access to wall cases. If windows are introduced there is again a loss of wall shelving and table layout must be modified.

Fig. 10 illustrates a two-storey alcove type specially useful in libraries with many comparatively small classifications of books on specialized subjects; alcoves may be devoted to each subject and students are able to work near the books they want without moving about the room. For the table layout shown in Fig. 10, it is assumed that the main wall of the room is external and the alcoves each have a window at each level.

On the lower level, where more space is available, bookcases are placed under the window and tables, designed for four persons, are placed to give circulation to wall cases. On the upper level, in order to provide full gangway space, tables are placed against the window wall and wall shelves eliminated. This may be planned with a projection

## CENTRAL LIBRARY: GALLERIES

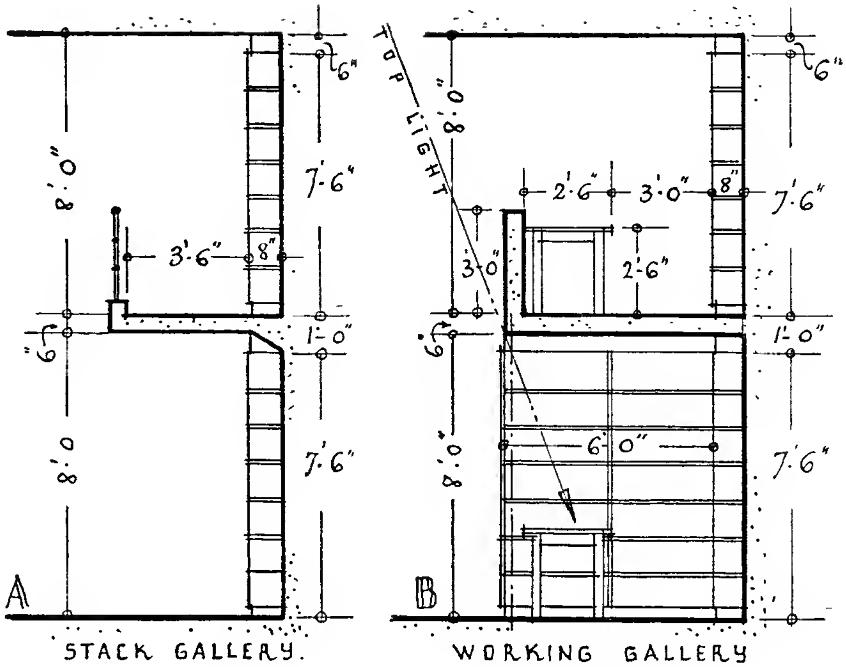
of three standard 3ft. cases on the lower level and two on the upper level.

Strong balustrades are put round all front galleries and it is usual to make these of an open type for supervision from the lower level. It is wise, however, to have a 6in. solid riser to prevent anything being kicked through the balustrades.

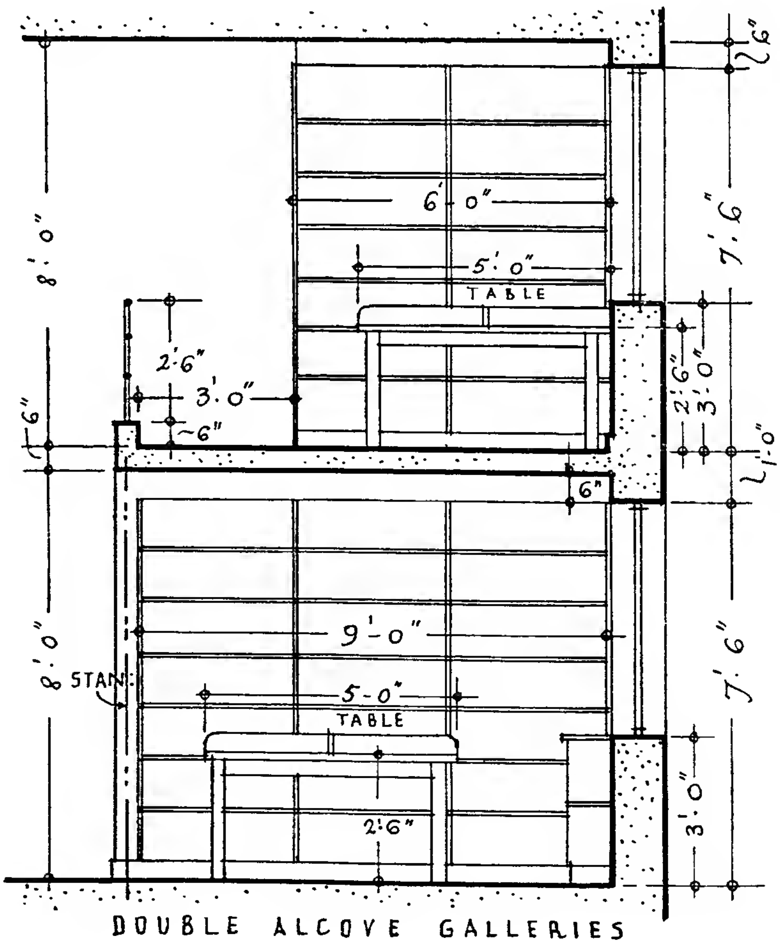
In Fig. 9 B, owing to tables being against the balustrade, the latter should be solid, as supervision of the tables is not difficult, and objects are prevented from falling from tables into the room below. It is desirable that there should be small book-lifts to connect all gallery levels to the main floor level.

Staircases between various levels should be at least 30in. wide and in general should not be of spiral type, the latter are difficult to use, more especially when carrying books. There should be two staircases to each level unless the galleries are very short. It is frequently possible to plan the staircase outside the main walls of the room, approached from lobbies at each level; and such a system does not waste wall space, nor do the staircases make unsightly projections in the main room. Staircases placed on the outside of galleries can be very unsightly, particularly when of the spiral type. When alcoves are used, the end bays on a length of wall are often made of such a size as to accommodate staircases, so that the general treatment of the room is not affected and ordinary gallery circulation or normal bookcase layout is not impeded. It sometimes happens that galleries are planned to be approached from other parts of the library than from the main floor or the reference room of which they form a part; with such a layout the main staircases of the library may form communications between the levels and secondary staircases are not needed.

The front edges of galleries may be used for fixing artificial lighting reflectors for the general illumination of the main room, the source of reflected light being from the main ceiling. The thickness of the gallery floors may also be used for letting in flush or semi-flush fittings to serve the parts of the room under the galleries. Alcoves without windows continually need artificial light and this may affect the level of the underside of the gallery floor; consequently, some space above normal bookcase height (as shown in the figures) is desirable.




Above: Fig. 9 Below: Fig. 10 Reference rooms, galleries



### Commercial and Technical Rooms

Many central libraries make special provision for commercial and technical users, especially in relation to important local industries. When such collections amount to more than a few books, separate rooms are set aside, generally consisting of a combined reference and stack room. The books housed are standard technical, quick reference and encyclopædic works, together with official pamphlets and reports, news-cuttings, catalogues and price lists. They are accommodated in normal shelving of suitable sizes, but some other publications, such as news-cuttings and catalogues of all shapes and sizes present storage difficulties; catalogues seem to be dealt with most satisfactorily in box files, which can be placed in shelves either horizontally or vertically, the former being better in many ways.

Commercial libraries need display and storage space for periodicals. An important factor in design of periodical stacks in commercial rooms is that reference is very frequently needed to back numbers during periods between issue and binding. The current issue of each paper is displayed on a rack which forms a cover to the shelves on which are placed past numbers until removed for binding.

Commercial libraries must provide information rapidly, and need a very careful and complete filing and cross-reference system which will occupy more space than is generally needed for a similar amount of ordinary library work. Some reference libraries cater for supplying information of an urgent nature by telephone and consequently an efficient system is essential.

### Special Storage and Display

For details of music, gramophone records, prints, maps, lantern slides and micro-film, *see* Part 1: Storage.

### Work Rooms

The private office of the chief librarian is generally a moderately large room, as it usually has to serve also as the committee room, although sometimes a separate committee room is provided. Separate lavatory accommodation is usually attached to this room. Some bookshelves are needed in addition to the usual office furniture for a private office. A strong room or large safe is sometimes placed in or adjoining the librarian's room, but in large libraries it is too large for such a position and is placed in the basement. It is essential that good ventilation, temperature and humidity be provided in strong rooms, as books and papers of value have to be stored in them.

In central libraries there is a considerable amount of administrative work, requiring a secretary's and typists' rooms; these should be located so that any noise does not disturb the library or work rooms where quiet is essential.

The work rooms for the staff must be well-lighted, airy rooms, suitable for continuous working. They are equipped for various purposes such as cataloguing, filing, book repairs and binding; tables, benches, cupboards, sinks and services, as necessary for each type of work, should be provided. At least one store room is necessary for files, old books, books for removal or repair, new acquisitions, etc.

A staff mess or recreation room, or one for each sex, is needed, together with cloakroom and lavatories.

Proper provision should be made on each floor for a cleaner's store with cupboard, shelving and a sink.

### Special Libraries

Libraries attached to schools, universities and learned societies are similar to public reference libraries in all general respects, but usually make special provision for students making detailed researches into particular subjects. For such purposes study tables, separate study rooms for individuals, or for several persons, are placed in or adjoining stack rooms, so that students may obtain the books which they require with the minimum of help and supervision by the library staff. Provision for these students may be made in several ways; firstly, by tables in convenient places between stacks; secondly, as shown on the left-hand side of Fig. 11, by tables at the side of the stack room, divided from the main stacks by low bookcases about 4ft. high, to allow light from the wide windows to reach the main book stacks; a division or screen is placed between the tables, and this may be also about 4ft. high; a tall glazed screen is an alternative. These recesses or cubicles should be about 3ft. 6in. wide and not less than 5ft. long, with a table across the full width; in front of the tables should be book racks for open volumes and shelves for other books, etc. Doors are not required to these cubicles. Good day and artificial light is essential.

The third type, for more important students making special researches which may take a long time to complete, individual study rooms are sometimes provided, as shown in the upper part of Fig. 11. These rooms should be divided by partitions, and have doors to lock, as books of value may be left in them at closing time each day. The rooms should be divided from the stack room either by glazed partitions, or preferably by solid partitions with similar partitions between the rooms themselves. Such rooms are best placed parallel to the stacks, so that the ends of stacks are open to the light from side windows, or only separated by low divisions as shown in the figure. In planning study recesses or rooms, dimensions should be based on the steel layout required for standard book stack steelwork, especially where multi-floor stacks are required. The individual study rooms require to be about 5ft. 6in. wide by 7ft. long and need a bookcase and a table for reference or for spreading out papers, in addition to the normal reading-table and book-rack fittings.

Many university and similar libraries use the alcove system to a very great extent, and therefore combine the reading rooms and stack rooms into one or more rooms of the above type. Fig. 12 illustrates a type of alcove system in which rather more books can be accommodated than in the standard type previously illustrated. The type shown has two double-sided book stacks between each pair of alcoves, with a narrow gangway between the two stacks, which only needs to be about 3ft. wide. In all other respects the planning of the alcoves remains as previously illustrated. It should be noted that in the method shown in Fig. 12, the windows may be planned so as to provide a wide spacing. The 3ft. book spaces between the stacks may well be lighted artificially with local switches.

The requirements of special libraries for learned or technical bodies and societies vary very considerably owing to the variety of types of materials to be housed. Scientific and legal libraries, for instance, have to have large numbers of past periodicals available for rapid consultation, while others may have especially large collections of maps, prints, or manuscripts which

## SPECIAL LIBRARIES, COMMERCIAL LIBRARIES, LIGHTING, VENTILATING AND HEATING

need very different accommodation; but for all the general housing of books, standard shelving serves as a basis for the main needs of the library; the special individual needs of each particular case are additional problems for discussion and solution on merits.

### Commercial Libraries

Library facilities are frequently required in industry associated with offices, laboratories and research departments. The planning should normally follow the suggestions made for special libraries rather than public libraries. Much of the work in this type of library takes the form of collection and collation of information for use by the staff of the organization. In general, it may be assumed that more working space and less reading space than is usual may be required in these libraries.

### Lighting

Artificial lighting is a matter which cannot be too greatly stressed as needing very careful attention in library buildings, in order to provide really adequate light, on reading surfaces in reading rooms, and on bookcases in lending libraries and stack rooms. Glare must be avoided, and also strong shadows. General lighting is essential in addition to any local lights; the latter are best if not fixed to or placed on removable furniture, such as tables.

### Ventilating and Heating

It is essential that library buildings in which persons have to sit for long periods be properly heated and ventilated, but the care of the books must also be carefully considered. Dampness must be eliminated in stack rooms, but excessive heating is, at the same time, detrimental to books. Ventilation must be so arranged that wall space suitable for book stacks is not used more than necessary. Heating must be specially considered near entrances to rooms where doors are being constantly opened and closed. Radiator positions must also be considered in relation to book stacks, as they may cause loss of stack space and also damage books. Low temperature panel heating in ends of stacks or in ceilings should be given special consideration and is often more suitable for the comfort of readers than local floor or wall radiators placed near tables used by readers.

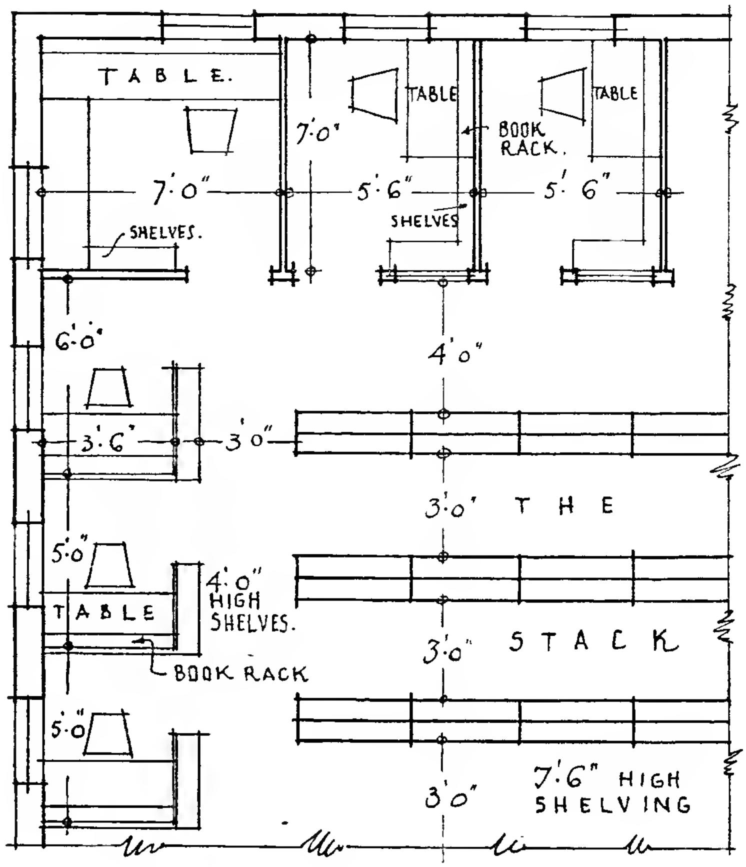



Fig. 11 Special study rooms

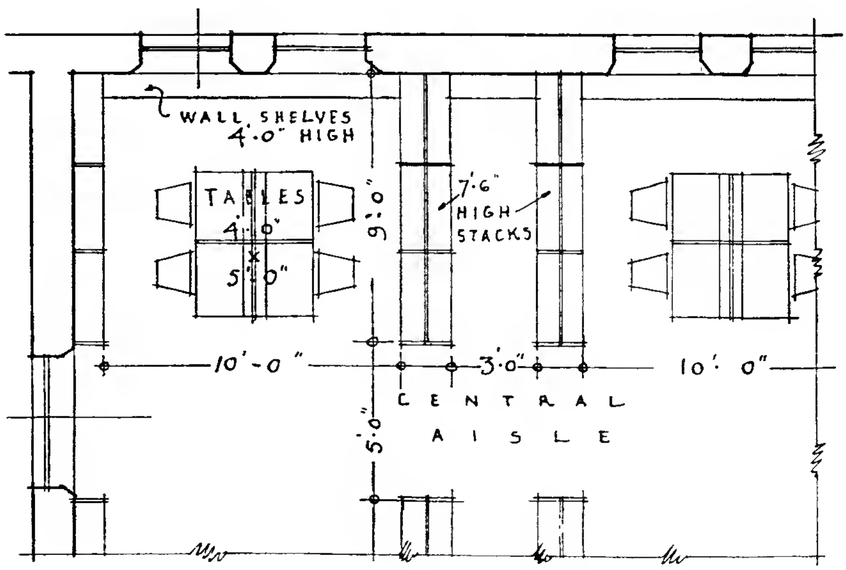



Fig. 12 Alcoves in a school library

## Introduction

The general requirements of fire stations are fairly simple; the actual work of erection is complicated by special equipment needed in conjunction with call apparatus, checking of time, heating of machines, etc., all of which have little bearing on the actual planning of the building other than space for ducts, conduits and wall-space for dials, switches, etc.

Fire stations vary considerably in type; there are the small lock-up stations needed in villages and small towns where the personnel is largely, if not entirely, voluntary, with normal occupations elsewhere; but there are also large stations with many appliances and a large permanent staff, working in shifts or on a reserve system, many or all of whom are housed on the same site as the fire station serving urban areas.

Organization of personnel affects to some extent the planning of the buildings, more particularly in regard to rooms other than those for the housing and administration of appliances. Small brigades in villages or attached to private firms or to estates depend on a volunteer system, while smaller towns often employ a small full-time staff assisted by volunteers; larger towns and cities have full-time fire officers. It is desirable that as many full-time officers as possible be housed in the same building, or preferably on the same site, for ease of assembly in times of emergency, even when they are nominally off duty.

It has also become customary in many areas to house at fire stations other emergency equipment such as ambulances, which are mainly and regularly used in co-operation with the police, hospitals, etc., but are required from time to time in direct conjunction with fire appliances. Advantage may be taken of using the same call systems, relief staff and repair workshops for ambulances as for the fire brigade, when services are operated by the same authority.

With increased mechanization and improved communications it is now usual in larger urban areas and even country districts to concentrate the fire services in central and sub-central stations and to eliminate smaller stations. It has therefore become necessary to provide for special ambulance stations at more frequent intervals than fire stations. Ambulance stations are, in congested areas, often located at hospitals or in stations specially designed and equipped.

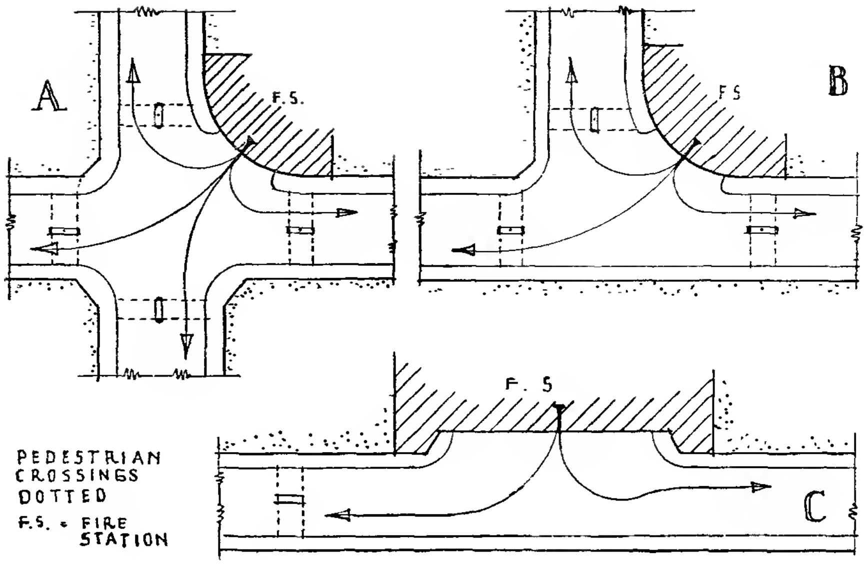



Fig. 1 Site and traffic

## The Site

There are certain very desirable features which should influence the selection of sites, especially when these are situated on busy streets. Sufficient land should be acquired to permit of extensions, unless the area is already fully built up and not likely to be changed greatly in the future; sufficient land for adequate drill yards, repair shops and, if required, housing for staff and families is essential. In many schemes put up in the past cramped sites have been chosen in order to obtain stations in central built-up areas, for reasons more important in the days of horse-drawn vehicles than with modern mechanical appliances.

There is considerable variation of opinion as to whether fire stations should be placed on main thoroughfares, or whether they are better located in minor or side streets. The important factors are ease of access from the street in which the station is placed to all parts of the area to be served, ease of traffic control and streets sufficiently wide to allow rapid but easy turning out of the station in all directions. Sites placed on corners may appear to have some advantages from the point of view of access to all parts of the area, but traffic may, in such places, easily cause difficult congestion even when traffic lights are operated from the station to stop all traffic in the neighbourhood. Machines leave the station so rapidly after a call is made that the street traffic has but little time in which to stop, or to take up position out of the way, nor has congested traffic at a street crossing time to get away and leave the roads clear in all directions.

Fig. 1 illustrates three sites for fire stations; Diagrams A and B are both corner sites, but C shows a site with a normal straight street frontage away from side and cross streets. In both A and B turns into the two streets flanking the station are rather difficult, while access to the other street or streets involves difficult routes across traffic lines. It is advantageous to have secondary means of access to the appliance room, either from a side or back street into a yard, to avoid backing engines from the street into their positions; if there is a yard sufficiently large approached from another street the machines are driven straight to the places indicated on Fig. 2.

A petrol pump is often required in the layout of a large station; it should be located in a position that will avoid

obstruction of important circulations by any vehicle using it. The pump is sometimes placed in or near the ground-floor space provided by the hose-tower. Storage of petrol is governed by the Petroleum Acts, 1928 and regulations issued thereunder.

### Main Accommodation

The most important element is the appliance room, in which vehicles stand ready for immediate departure. Vehicles should be arranged in a single line; only in exceptional circumstances should one stand in front of another. Exit doors in front of each vehicle are essential and behind the vehicles another set of doors giving access to the drill yard and washing space. Part of the washing space should be covered. Adjoining the appliance room and communicating with it, must be placed the watch or duty room in which officers are on constant duty with all means of communication from outside, internal communication and recording and control; various call systems are employed in larger cities, such as street call boxes and telephones. It is general to provide an office, preferably near the watch room, for the officer in charge of the station. Rooms for recreation, meals and resting when on night duty are provided or not, according to the system of staffing. When rooms are provided on an upper floor the other floors should be connected to the appliance room by means of poles down which the firemen slide; these poles should be placed near the back wall of the appliance room in order to assist circulation to any machine without confusion. Workshops for repairs are needed and in larger stations become quite important rooms. A room for drying uniforms is important and sometimes also for hose drying, although the latter is frequently dealt with in hose towers, which also form part of practice and training routine.

### Appliance Room

The size needed varies considerably; separate bays are really essential for each vehicle. There is no certainty as to which one will have to leave first, since the nature of the next emergency call is unknown. The width of bays is generally about 15ft. centre to centre, but in smaller stations, in stations where sites are very expensive, or in congested areas, the bays are sometimes reduced to about 12ft. centre to centre. Full circulation round each vehicle should in all cases be provided. The depth of the appliance room is also variable, and depends largely on the size of apparatus chosen to serve the locality; for the larger type of station a depth of 40ft. is needed to house machines having 100ft. turntable escapes or fire towers. Some of the largest machines used in the main city stations are about 31ft. long and the full legal limit of 7ft. 6in. wide. The depth needed for smaller apparatus to be housed should be about 30ft. to leave sufficient circulation space. The height needed for larger appliances is 15ft., although in some stations this height can be reduced to about 12ft. in the clear; these heights not only are needed under all beams but in the door openings to streets and to yards.

Various equipment is needed in appliance rooms, such as heating, signal lights, exhaust ventilation, time-recording and door-opening gear. Each scheme has some or all these installations, but the effect on planning is not considerable. It is not proposed to discuss such equipment at great length.

The main doors require special opening gear. Owing to the large size of the openings, doors in four or six folds are general, two or three folds moving to each side. Many systems of operation have been installed and special claims are made for each type. Some are opened by hand at the doors themselves, others from the watch room, others by the driver of each vehicle when he is ready to move. Motor-driven systems, it would seem, should be avoided unless every possible breakdown can be guarded against; also it seems unwise to open the full range of doors if only one machine is to leave, especially in winter-time, when engines need to be kept as warm as possible. One good system appears to be the operation of one set of doors by the driver close by (or when seated in) the driver's seat and ready to move; this is accomplished by the installation of a vertical cable-pull geared by means of arms and levers to the door locks and bolts.

Many stations have installed plant to remove exhaust fumes from the engines, which are started up and run in the appliance room several times a day (in some brigades every two or three hours). The value of such an installation is thought by many authorities to be very doubtful, especially if involving direct connections to the exhausts of the vehicles. If, however, such an installation is made, great care must be taken that it is so placed that all machines, of any length, can be connected to the duct, which means that it must be placed slightly to the rear of the longest machine and so calculated as to provide easy bends for the flexible piping, but not so far back that the connections prevent easy and rapid circulation from the sliding poles (if any) to all machines.

Various systems of keeping engines warm in cold weather are installed to ensure immediate starting. Heating panels have been placed above and below the engines, but these may not be very effective when doors have to be opened. If a system depending on direct connections to service mains is installed, such as electric heaters, care must be taken to make it impossible for an engine or escape to move until the mains or services are disconnected.

A repair pit, as outlined under "Garages and Parking Spaces," should be installed in one of the bays if a separate workshop or repair shop is not provided elsewhere in the scheme.

Wall space at the ends of the appliance room is often used for pegs on which certain parts of the firemen's uniform equipment, such as coats, belts and helmets are placed, ready to hand when passing from the sliding poles to the appliance which is to leave in answer to a call. Fig. 3 illustrates the importance of placing sliding poles near the back of the appliance room, so that access to vehicles is from the space at the rear of the machines: thus no person risks passing in front of a moving engine.

Various alarm, light and directional indicator systems have to be installed, each of which has indicators in the appliance room; a special light system (when there are several appliances) to indicate which appliance is to leave first is often included.

Fig. 3 illustrates the main sizes needed in plan and section for appliance rooms. It is important that at least 4ft. space should be allowed between the front piers and appliances, in which doors may open and, if necessary, a person can pass when the doors are at right angles to the road,

and at least 4ft., and better more, is needed for circulation at the rear of the appliances.

Behind the appliance room, approached from it by doors similar to those on the street frontage should be a covered and paved space for drill, cleaning and minor repair work; this covered space is best if it is sufficient for the longest machine to be covered, and this may be at least 30ft. It is most desirable, for ease of handling the vehicles, for the covered space to be free from all obstructions such as piers or stanchions. Covered spaces should be glazed in some way, not only to light the area below the roof, but also to assist in lighting the appliance room itself, which generally depends for daylight on light from the upper glazed parts of the doors on to street and yard.

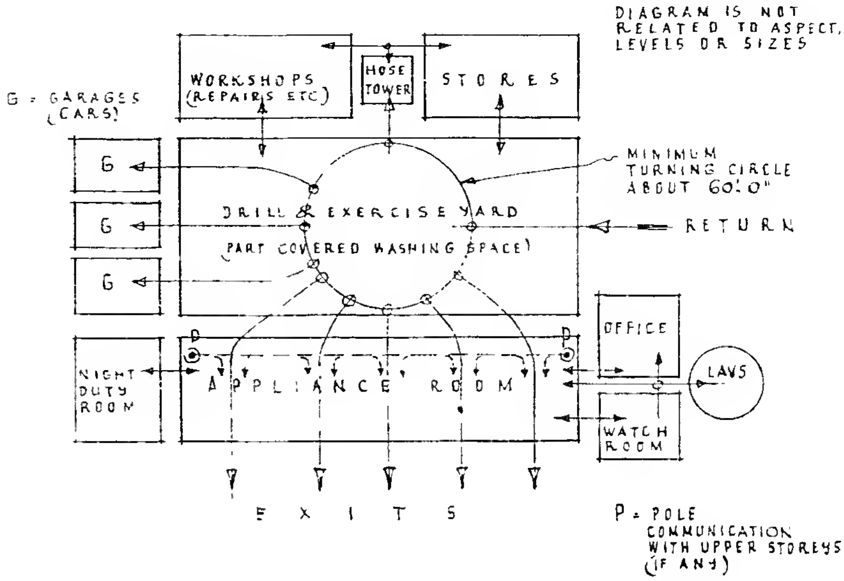



Fig. 2 A typical ground plan analysis

### Weights of Appliances

The floors of appliance rooms, service yards and any approach roads, together with any manholes or other service covers, should be designed to carry the loads of modern fire-fighting apparatus. The maximum normal load to be calculated for is about $6\frac{3}{4}$ tons; light escapes and pumps vary between 17 cwt. and 2 tons. The weight of a 100ft. turntable escape ladder is 12 tons, but as this is an appliance required only in central or sub-central stations in urban areas containing high buildings, it is one for which provision is not always needed. All appliances are designed to operate within turning circles of 60ft. or less.

### Sliding Poles

The poles used for communication between floors are generally of brass or bronze and about 3in. in diameter; whenever possible, they should be in one length without joints, but if jointing is necessary care must be taken to ensure perfectly smooth junctions. Poles usually extend from one floor to the next floor below only; separate poles are used by firemen on each floor in order to eliminate the possibility of men from one floor dropping on to men standing on or starting from a floor below; the most general arrangement is to change poles at each floor level. The space required for the enclosure or opening in the floor round a pole

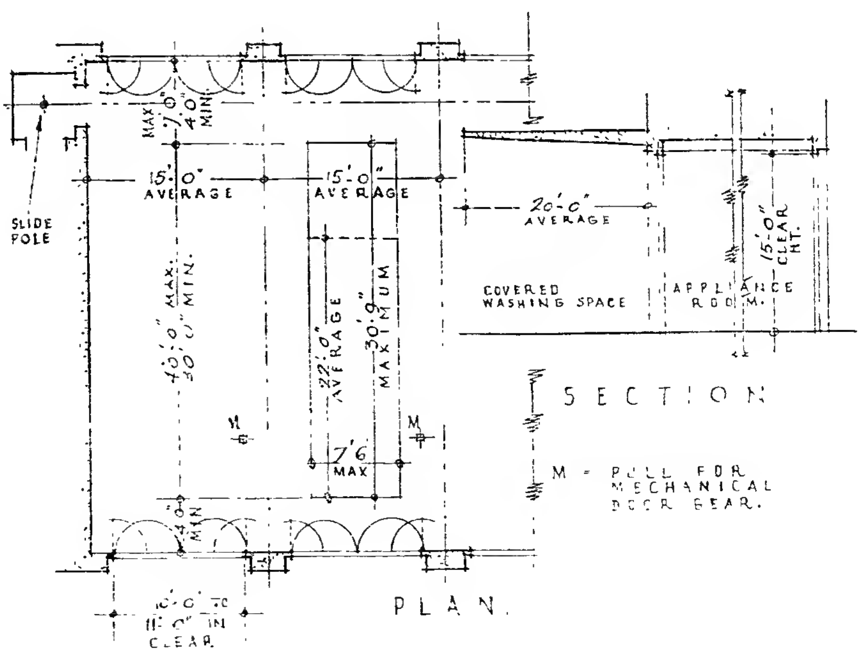


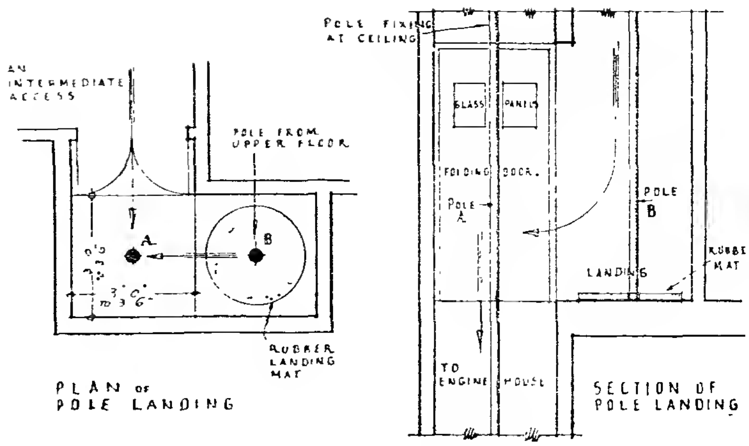

Fig. 3 The appliance room

should be from 3ft. to 3ft. 6in. across; these enclosures are usually square and should have smooth walls without breaks or projections of any kind. Poles are sometimes placed in the appliance room itself without an enclosure and such poles should be placed about 1ft. 6in. from any adjacent wall or projection; this position for poles appears to be dangerous as many persons may be moving about in the appliance room. Great care has to be taken in planning doors giving access to poles as it is essential that very rapid access be possible, but at the same time there must be no risk of accidents due to unprotected openings in walls or floors.

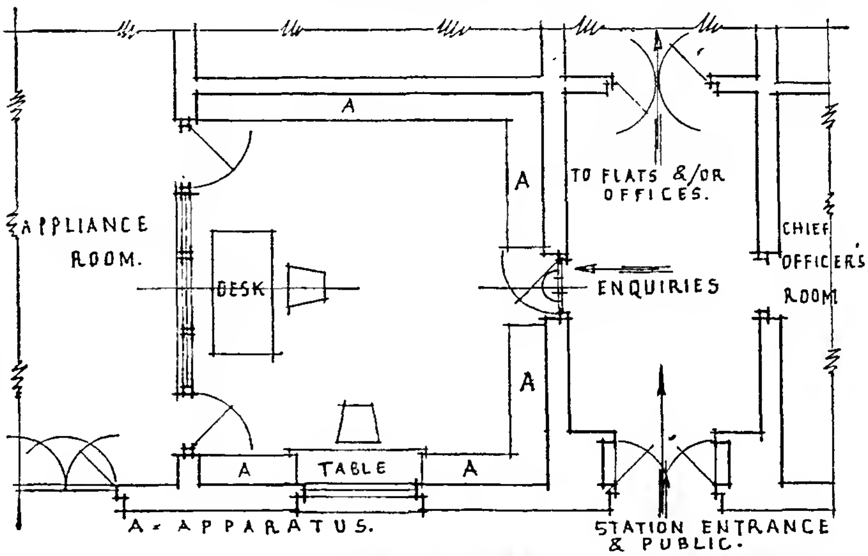
Fig. 4 shows a typical arrangement of poles at one floor level when there is another pole adjoining from an upper floor. The pole from the upper level delivers persons in such a position that they can see the doorway giving access at that level to the pole serving the next portion of the drop. Doors must open in the direction from which the men come and must open clear of the pole enclosure space; the doors are usually fitted with self-closing apparatus and also a locking gear or spring catch which has to be released before access to the pole is possible. The doors are usually folding instead of being hung as single doors. At the base of each pole, a cushion or mattress is needed which is often a thick rubber pad fitted closely round the poles.

### Watch Room

The size of the room needed varies according to the amount of call and recording apparatus to be accommodated and, to some extent, on the size of the district to be served. The entrance to the fire station should be adjoining the watch room in order that it may control all persons entering the building including both staff and visitors. There is often a hatch or counter for inquiries between the watch room and the entrance hall. A considerable length of wall space is essential for apparatus, such as telephones, alarm indicators and recording apparatus of various types. The room should have good daylight as it is in constant use. It is most essential that this room should not be cramped in area as changes and increases in the amount of apparatus are frequently




Above: Fig. 4 Arrangement of sliding poles Below: Fig. 5 A typical watch room



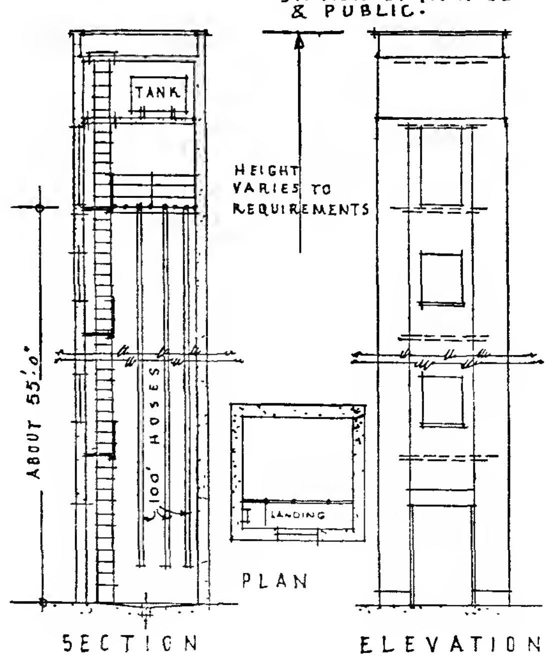




Fig. 6 A typical drill and hose tower

needed and the efficiency of the station is largely dependent on the good working of the watch room and its staff. It is quite usual to place a small office near or even adjoining the watch room for the use of the chief officer; this room is a normal type of office room and requires no special planning or equipment. Fig. 5 illustrates a typical watch room, station entrance and relationship of watch room to appliance room.

### Staff Accommodation

The upper parts of larger fire stations are used for staff rooms and in many schemes for housing part of the station staff. In many small districts where the fire brigade is voluntary, little space is needed in addition to the appliance room, drying room for hoses and equipment and an office; larger stations have one or more full-time and resident officers (often the chief officers) with the remainder of the staff being volunteers, stations of this type require a small watch room and the upper floors may be used as living accommodation for full-time officers.

Large stations in more important areas having a full-time staff house the men in whole, or in part, at or adjoining the station. Single men are often housed in the station building and, at least, some married men in flats or cottages over or adjoining the station. Special provision is sometimes made in special bunk rooms or other communal rooms for men to rest without undressing during night-shift periods.

All large stations provide rooms for staff recreation and for meals, at least when on duty. These rooms have to be planned on a more generous scale in those stations having a number of resident officers. The rooms required for housing of unmarried officers are planned on the general lines of a hostel with small bedrooms or cubicles with communal dining- and recreation-rooms. (*See* section " Hostels.")

### Drill Tower

Nearly all fire stations are provided with a tower which serves the joint purpose of hose drying and in connection with training. There are no very definite sizes for these towers, but an average size seems to be about 10ft. by 10ft. inside the enclosing walls, although many are smaller. The height, often about 60ft., is governed by the length of hose used, which has to be suspended for drying, either by its end or by the middle of a length, and by the height thought desirable in each district for the purpose of a practice tower. The tower should have a large opening at the base into which a hose truck can be wheeled and in some districts provision is made at the base of the tower for heating coils or braziers to dry hoses in cold and damp weather. The tower itself is built on the lines of one bay of a building complete with window openings from which rescue work with scaling ladders, escapes, etc., may be practised. It is general to provide landings at each normal floor level connected together by steps or ladders; these landings must not take too much of the internal area of the tower as sufficient space for the hoses must remain. The hoses are drawn to the top of the tower on pulleys either by hand, or in some stations by a mechanically operated winch. In some schemes a water tank is installed for practice work at the top of the tower to which water is lifted by pumps from sumps in the drill yard in which the water is re-collected.

Fig. 6 shows a typical hose and practice tower in section, elevation and plan. The towers are constructed in various materials such as brick, concrete, but sometimes are only steel frame skeletons.

Some chief officers prefer to use the tower only for drill purposes and to use drying rooms for hoses in which it is claimed that hoses may be dried more rapidly, a matter of importance in more congested areas; such drying rooms are dependent on some forms of heating together with a method of extraction of the humid air from the room. A hose-drying room, if provided, is generally quite apart from the usual drying room provided for firemen's clothing; the latter needs ample ventilation together with heating coils over which clothes are hung on racks.

# Clinics and Health Centres

## INTRODUCTION, SITES, VILLAGE CLINICS

### Introduction

Arising from the extended Public Health Service it will be necessary to inaugurate a gradual reorganization of the services provided or to be provided at health units or clinics; as yet the final pattern of the complete scheme remains somewhat obscure and therefore these notes are based mainly on the types of health unit or clinic at present in use; they will be revised when the future needs become more crystallized.

The purpose of clinics or health units is to provide medical advice and attention to varying groups of persons as part of a full public health service. These units may be either part of the services provided through the Hospital Regional Boards or may be administered by the County or County Borough authorities for the hospital scheme.

The health units or clinics may be completely separate, attached to hospitals or a number may be grouped together to form a Health Centre. The units may be devoted entirely to one branch of medical treatment, such as tuberculosis, ante-natal or dental but in other cases may be planned to be interdependent. A new development of which few examples yet exist and which has directly arisen from the National Health Scheme is the provision of units for medical and dental practitioners to replace the private surgeries normally found attached to doctors' and dentists' houses. Here, in future, patients will attend for consultations or treatment by the doctor or dentist with whom they are registered under the scheme.

Up till recently the more important types of clinic have been those devoted to maternity and infant welfare, school clinics and a few specialized clinics attached to hospitals for particular ailments. The maternity and infant welfare clinics deal with ante-natal patients together with infants from birth to school age. This type of clinic is sometimes attached to maternity hospitals, to training centres for child nurses and even to day nurseries or crèches where children are left at times when their mothers are at work.

### Health Centres

There is a likelihood that a number of units for different purposes will be grouped together for simplification of administration and to share certain services. The main and more usual units forming a Health Centre seem likely to be, a medical practitioners' and dental surgeons' unit, an ante- and post-natal unit, a child-welfare unit, a school-health unit, a physiotherapy unit, a child-guidance unit, an ophthalmic unit and possibly a body-disinfestation unit. The specialized units devoted to the treatment of particular ailments are more likely to be attached either to general hospitals or to specialized hospitals.

Some Health Centres and some units are likely to provide also certain semi-social activities, such as clubs where mothers and children meet for lectures and demonstrations, and may therefore need facilities for light refreshments.

Main Health Centres in each locality may also need considerable accommodation for administration staffs and for staffs such as those representing the Medical Officer of Health, Sanitary Inspector, Health Visitor's Service, Home-Helps Service, Ambulance Service and Pathological Service. Most of the accommodation for these purposes takes the form of normal office planning, with a few small laboratories.

### Sites

The choice of sites for clinics is often somewhat difficult, and usually depends on the size of the town, its population and the area over which the population is distributed.

Large towns may have the central administration of the clinics either at the municipal offices, where the medical officer of health for the district is likely to have his offices, or it may be attached to a large central clinic. The larger towns often need smaller branch clinics dealing with maternity and child welfare organized, for example, in detached housing schemes and similar concentrations of population, and have more specialized central clinics, to which patients are sent with particular diseases or for special treatment, of which one only of each type is probably necessary; these special clinics may either be separate buildings, or may be grouped together in some position to which access from all parts of the town is more or less equally easy. Generally it is desirable to choose a site to which access may readily be obtained by the public transport services, such as buses or trams, and generally near the main concentrations of the population, although these two points may be found almost impossible to satisfy, as the general lines of transport lead to the centre of towns and the population is often spread more or less evenly round the outskirts.

Those clinics whose work is mainly among children, and especially those to which there are attached nurseries and crèches, should have ample space around them for gardens and open-air playgrounds. All clinics should be placed on sites which permit of good light, ample ventilation and, if possible, quietude.

Sites on main traffic thoroughfares and similar high-value positions are unnecessary, and back land without extensive frontages can often be utilized to advantage for buildings of this nature.

The buildings need to have at least certain departments on the ground floor, and, except on confined sites in congested areas, a large site area is helpful in order that the rooms dealing with patients to whom stairs present a difficulty may be placed on ground floor levels. Upper floors for many departments necessitate the provision of bed lifts for patients in invalid chairs of various types, some of which are nearly 7ft. long and for the occasional stretcher case.

When multi-storied buildings are involved, maternity and child welfare should be on the ground floor and, if possible, the tuberculosis department should be similarly placed.

### Village Clinics

In villages, where the population is small, clinics are often held in the village hall, as is described in the section on "Community Centres." Clinics in buildings of this nature are usually confined to one or two afternoons each week and the rooms, excepting perhaps one room, are normally used for other purposes, and not specially designed as part of a clinic; such clinics are generally devoted to maternity and child welfare, dentistry and possibly also eye-testing, so that patients who need assistance of a more specialized treatment are sent on, after preliminary examination, to other clinics or hospitals.

**General Layout**

Fig. 1 shows a general analysis of the larger type of clinic building, but the principles remain the same for all types.

One main entrance is usual, although secondary or individual entrances are often provided to certain special departments, such as child welfare, tuberculosis and an entrance by which invalid chairs and perambulators may enter by a ramp and go straight to the lifts.

Adjoining the entrance should be placed covered and preferably enclosed facilities for the temporary storage of perambulators. Near the entrance, in larger schemes, certain rooms are generally needed for the main administration. Rooms for the medical and nursing staff, together with cloakrooms and lavatories, should be approached from a circulation apart from that of the patients; some general rooms are needed other than the actual consulting rooms and may, in very large schemes, involve a small laboratory, library, dining-rooms, in addition to rest rooms, offices and record rooms.

The patients usually go from the entrance hall into a central main hall which may serve as general waiting room for all departments, or only as waiting room for those who do not know to which department they go, or are waiting to see those connected with general administration. In large schemes each department is likely to have its own waiting hall. Refreshments are often available in the main waiting hall. Lavatory accommodation for each sex must be attached to the waiting halls.

The dispensary, which may both serve medical requirements and also sell special foods, such as baby and invalid diets to patients of clinics, should be adjoining the waiting hall, except perhaps in large establishments, where it may be placed in the central or entrance hall, or even attached to individual departments.

In multi-storeyed buildings staircases and lifts should lead from the central hall and should be placed in such a position that they are quickly seen on entering the hall. A direct external entrance for invalid chairs should be provided. The departments should all be approached from this hall and should be considered as quiet separate units. If the central hall serves also as waiting room for the departments, a secondary circulation is desirable, so that patients after examination or treatment do not necessarily re-enter the hall; a circulation of this type should not pass through other departments, nor if possible should there be any chance of patients of various departments intermingling.

**Waiting Hall**

The waiting hall is a centre about which the whole of the work of the clinic revolves, and in consequence many doors and corridors have to be planned leading off it to rooms and even whole departments. In the small clinics one room serves as waiting space for all departments and all purposes, but in larger schemes some, if not all, the main clinical departments are likely to need their own waiting rooms, thus leaving the main waiting hall as a circulation space and for persons waiting for attention from certain general departments or services such as administration, first attendances, dispensary and possibly food service.

The waiting hall in all schemes needs to be a large room in relation to the size of the whole building, and a satisfactory floor area to allow is 8sq. ft. to 10sq. ft. of space per head of the estimated number of persons likely to be waiting at any time. The best shape of the room is rectangular. Although a large number of doors leading from the room is almost essential, these should be reduced to a minimum, particularly by the introduction of surrounding circulation corridors from which the individual consulting rooms or departments may open. The hall should be well proportioned, both in plan and section, so that the general effect of the room is pleasant and spacious. Many schemes rely entirely on top-lighting for the waiting hall, with ancillary rooms on all sides, but there is no doubt that a large room of this character is much more pleasant if some normal side-lighting from windows can be arranged, especially if the outlook is over gardens or well laid-out courtyards. On the other hand, lighting into small areas is undesirable.

When side light is provided top-lighting may also be needed if the rooms are very large.

**Waiting Hall Seating**

The furnishing of waiting halls generally consists of long benches, which are arranged in rows, or individual chains. Benches should not be spaced too close together, nor should they be very ong, as they become too heavy to move easily for cleaning purposes. A good spacing for benches from back to back is 3ft., and a length of 1ft. 9in. per person is adequate, with a maximum length of 10ft. 6in. long (six persons), though it is better to reduce the seats to about 7ft. in length for ease of handling. Benches usually have backs and are without arms, but arms at the ends seem desirable, at least for reasons of strength. The seats are sometimes of wood, although upholstery is often provided to make the benches rather more comfortable for invalids. Chairs give a more pleasant and less formal appearance. The main objection to chairs appears to be from the point of view of noise. If the room is to be used for refreshments and particularly if it is likely to be used for such purposes as a "mothers' club" in conjunction with a maternity and child welfare clinic, tables and chairs seem to be more suitable.

A space 6ft. wide should be left for circulation round the room between seats and the walls, except, perhaps, near walls without openings. A space 4ft. wide should be provided between ends of seats. Two possible methods of arranging seats are as follows: firstly, with seats all facing in one direction; secondly, the seats may be arranged back to back. This second arrangement is more pleasant, as groups of patients may then talk together. The first method may be better if the entrances to the consulting rooms are placed towards one end of the room, but this consideration does not arise if the doors are on opposite walls, or in the walls towards the ends of the benches, when the second method is quite satisfactory.

**Patients' Lavatories**

Lavatories are needed for both sexes in conjunction with the waiting hall, but it seems desirable that these should not open directly off the waiting hall, especially those to be used by male patients. The lavatory entrances should not be placed too near one another.

**Waiting Hall Refreshments**

When refreshments are to be served in the waiting hall a small counter should divide the kitchen or servery from the hall and the opening should be capable of closure when not in use.

## Waiting Hall Type Plans

Fig. 2 shows in diagram form the general arrangement of a typical waiting hall. The lavatories for male patients lead from the entrance vestibule at the approach to the main room. Surrounding corridors are used as approaches to the various departments and consulting rooms, so that the doors for these purposes are reduced to two, while the remainder of the openings are those to the buffet and to the women patients' lavatories. Top light is indicated, but in addition side windows are also suggested unless further rooms have to be planned on the fourth side of the main room.

Some waiting halls have special features incorporated in their planning and decoration as diversions or interests for the patients, especially children. Such features include an aviary, a fish pond, or a fountain. Care must be taken that they do not obstruct circulation, and that they are designed as part of the decoration scheme.

Fig. 3 shows a further type of waiting hall sometimes used in smaller schemes when the cost of providing remedial treatment rooms or gymnasia cannot be undertaken. Part of the waiting hall is used at some periods as a gymnasium and may, if desired, be divided from the waiting hall by a folding screen or partition. This figure also shows the refreshment service counter and the medicine and invalid food dispensary close together, as the same staff may have to control both these services, and in fact on occasions they are contained in one servery. The ample space near all circulations other than those to the consulting rooms should be noted. In this example all the staff and consulting rooms are kept together on one side of the waiting hall to assist control, supervision and administration. Certain of the staff rooms for administrative purposes may need to be near the entrance, but at the same time connected with the remainder of the staff rooms.

The waiting rooms for separate departments are similar in most respects to the main hall so far discussed, except that they are smaller, do not need rooms adjoining for such services as food and have fewer rooms opening from them. Again side light is desirable and in small rooms is to be preferred to top light.

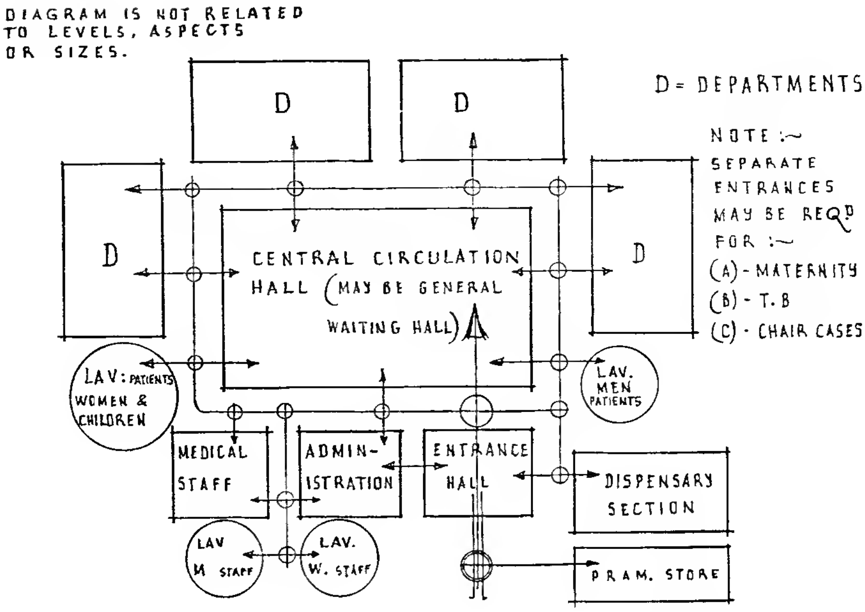



Fig. 1 General analysis diagram

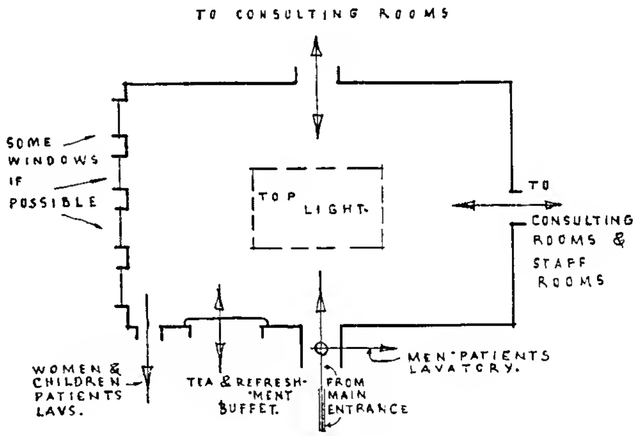



Fig. 2 Waiting hall

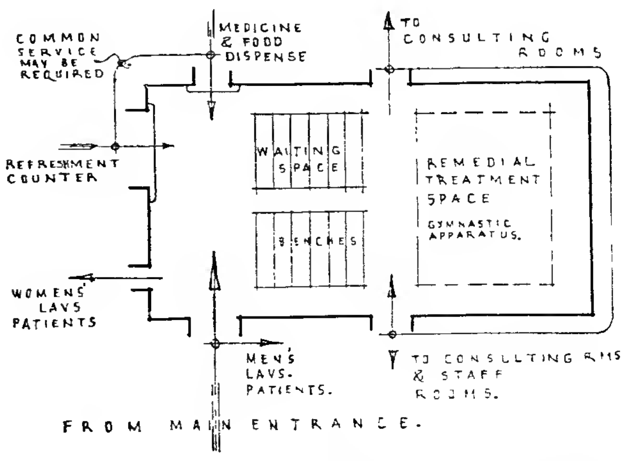



Fig. 3 Dual-purpose waiting hall

### Departmental Accommodation

An individual department may consist of one room only, or may require a large number of rooms; the numbers and sizes are largely dependent on the extent to which persons may be likely to require the services of the department, the number of sessions per week that the department is available and the branch of medicine for which the department is required; for example, an ophthalmic department may need one main room only in which consultations, eye-tests and treatment take place, although in a large establishment this main room may be repeated several times, but without many additional rooms; an alternative example where several rooms are almost always necessary, is a dental department: in addition to the room used jointly for consultations and treatments, a recovery room and workshop are usually needed. Each department may have its own waiting room, and in some schemes the department may be so large that it necessitates a separate building or wing.

### Consulting Room

The consulting room is the central working unit of most departments and around this room (or rooms in larger schemes) may be grouped all other departmental rooms. The sizes of consulting rooms depend largely on whether treatment is likely to be given in addition to examination of patients and the type of equipment needed for such treatment. The same consulting rooms are sometimes used for different purposes during various parts of the day or on different days of the week; for example, an ophthalmic consultation room may be used for ear, nose and throat work. Occasionally in small clinics one room serves for all consulting and treatment purposes, and for ante-natal, general medical and child welfare examinations, eye-testing and dentistry, but this should be avoided whenever the clinic is sufficiently large, especially by the separation of dentistry, which needs special equipment and services.

### Consulting Rooms: General

All consulting rooms need lavatory basins and, in some departments, sinks in addition. Consulting rooms should not be less than 9ft. high, and this figure should be increased for rooms having more than a minimum depth of, say, 12ft., as good lighting is so very essential for all types of examination and consultation. For general purposes where examination of patients and discussions with doctors and nurses only take place, without actual treatment, the rooms should have a floor area of at least 150sq. ft., and preferably about 200sq. ft., to allow ample space for the examination couch to be accessible on all sides and for the doctor's desk and several chairs. Rooms to be used for purely administrative work by visiting doctors may be smaller, say 120sq. ft., but it is general to consider these as normal private offices which have to accommodate the usual office furniture without basins, sinks or examination couches.

### Departmental Layout

Fig. 4 shows in diagram form the general arrangement of various types of accommodation for certain departments. Type A is the simplest, being used for those departments in which the patients do not normally need to undress. The actual example is based on an ophthalmic department, which needs a clear length of 21ft. for eye-testing, and generally needs a dark room attached to it; the 21ft. length may be given diagonally to reduce slightly the longest dimension of the room.

The width of rooms is dependent to some extent on the planning of other parts of the departments and the building generally, but 12ft. should be considered as a minimum; also the window wall should be the longest dimension of the room to avoid deep and narrow rooms in all plans.

Type B is a general medical consultation department where, in addition to the consulting room itself, dressing room accommodation is often necessary and also another room for use as doctor's office, nurses' room, or sometimes as a general dressing room for children. The access from dressing rooms to consulting rooms should be planned in such a manner that patients do not enter any general circulations. The amount of dressing accommodation varies considerably, in some large schemes many cubicles or dressing boxes are attached to each consulting room.

Type C shows diagrammatically a dental department. Through a small ante-room or lobby the surgery or treatment room is approached; in this example the treatment room shows two chairs. Any number of chairs may be required in this room, and their placing is dependent only on sufficient space being allowed for each chair and the dentist to work with such necessary services as are required; artificial light is used for all chairs which are planned away from the direct light of windows. When only one or two chairs are required these should be planned opposite and near to windows. Immediately adjoining and leading from the treatment or consulting room should be a recovery room, in which a number of chairs and couches may be placed, as well as certain special equipment; the recovery room must also have access to the general circulation without re-entering the treatment room, and in many examples this access delivers as quickly as possible to the main way out of the building, so that patients after treatment do not circulate amongst those awaiting treatment. Adjoining the treatment room in all larger dental departments there must be a workshop and a small store room; the latter may open out of the workshop in preference to the position given on the diagram.

### Dental Departments

Fig. 5 illustrates in greater detail a typical dental department for an average-sized clinic. The dental surgery itself acts as both consulting and treatment room and has an area of about 500sq. ft.; the area is amply sufficient for the three dental chairs shown. If one chair only is required the area of the room may be reduced to about 150sq. ft., preferably allowing a minimum width of 12ft. A lavatory basin is needed, and a sink is frequently provided in addition. The chairs should be spaced not closer than 8ft. apart centre to centre, while it should be borne in mind that most of the work is carried out by the operator standing on the right-hand side of the chair, so that the right-hand chair should not be placed too close to the wall on that side. The chairs each have a window directly in front of them. Each chair

requires a number of services, namely, water supply and drainage to the mouth-wash basin attached to or adjoining the chair, electricity for artificial light, power for drilling and other purposes and a connection for low-voltage lamps.

The normal recovery room has a number of lavatory basins fixed at a low level in order that patients may use them when seated on chairs. A room having an area of 150sq. ft. is sufficient for small surgeries with one chair, but this needs considerable space or, better, two rooms, as shown in Fig. 5, for use in conjunction with larger surgeries having several chairs. The figure shows a separate gas recovery room, into which patients may be carried from the dental chair either on stretchers or movable couches through double doors provided for the purpose; this room is also equipped with lavatory basins placed at a low level adjoining the couches.

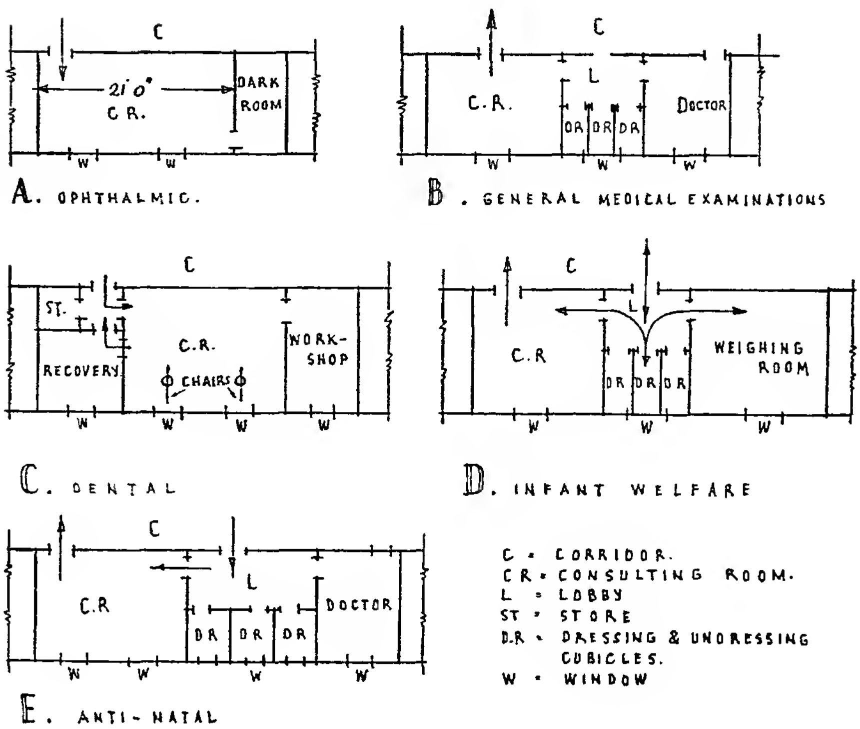



Fig. 4 Layout of departmental accommodation: type diagrams

### Welfare Departments

Type D on Fig. 4 is an infant welfare department; this needs direct access to dressing rooms, from which the children may pass directly to the weighing rooms and thence, at the request of the doctor, to the consultation room. The weighing room is often in charge of a nurse who is attending on some children while the doctor is examining others, many of the children being weighed only and not needing the immediate services of the doctor.

Type E is an ante-natal department, and is similar to that required for general medical examination. Dressing rooms are essential. The doctor's room may, in this department, also be needed as a consulting room for private consultations, while the consulting room is used principally for normal examination of patients. The doctors may need a separate small apartment adjoining, screened from it, as a laboratory for urine-testing.

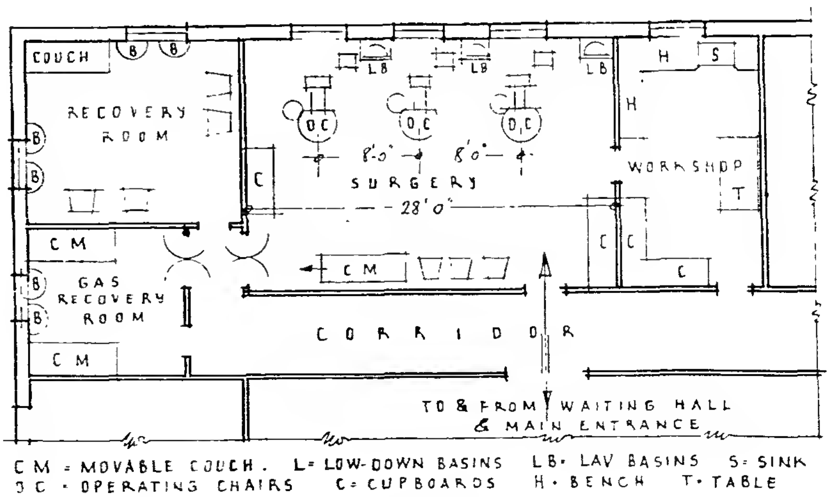



Fig. 5 Dental department

### Light Treatment Departments

Such departments may be very large, especially when combined with various other types of electrical treatment; frequently, however, a small department is attached to general clinics, especially those dealing with children,

where light treatment both of ultra-violet and infra-red ray types may be given. The essential accommodation for such a department is a waiting room with undressing accommodation, at least one main treatment room often used for collective treatment and two or more treatment and massage cubicles. Sometimes shower baths are provided in conjunction with the dressing accommodation, which necessitates duplicated dressing rooms if both sexes are likely to attend during the same sessions. The rooms needed for general treatment may vary much in size, being dependent on the number of persons attending each session. A control or operators' room is provided, separated from, but adjoining, the main treatment room, planned to contain certain types of electrical apparatus. Some of the apparatus used also necessitates insulation of the rooms from those surrounding and above it and although this demands various structural considerations in regard to finishings, it does not generally affect planning.

The small treatment rooms should not be less than 6ft. 6in. by 6ft., but for general purposes they are much more satisfactory if rather larger, as a treatment couch occupies a considerable part of the area. It is usual to provide daylight to all rooms used for normal treatment purposes.

Fig. 6 illustrates a typical light treatment department in a general welfare clinic principally for infant and children's use. The main circulation delivers into a departmental waiting room, around which are placed a lavatory and W.C.s, a shower bath, a waiting bench or seat and a number of dressing cubicles; this department is designed to be used by one sex at each period or for young children of either sex. The dressing cubicles are formed with partitions about 7ft. high, with either doors or curtains to close the entrance, the latter being considered sufficient by most authorities. The partitions between the cubicles may be of wood, metal, terrazzo or similar partition material, maintenance of cleanliness being the chief factor. The cubicles may be as small as 4ft. by 3ft., but it is preferable if they are increased a little from those sizes to about 5ft. 6in. A fixed seat is often provided in the cubicles, while the remainder of the equipment is usually a few hat and coat pegs.

The general light treatment room is approached from the waiting room and is often equipped with a low bench or platform on which the patients sit or lie. This bench is arranged round a central light source. Adjoining the treatment room, but not approached directly from it, is the control room, which has a small specially glazed observation panel between the two rooms.

A series of small treatment rooms are provided, each separated completely from the others. It is very desirable that these rooms should be of such a size that the treatment couch does not have to be placed against a wall, as circulation space for the operator is needed on all sides.

A nurses' room and doctors' room will be needed in conjunction with these rooms, but they need not necessarily be approached directly from the departmental rooms.

### Dressing Rooms

In addition to the information given above for dressing cubicles, some clinics have rather larger dressing rooms, which may be used for general medical examinations as, for instance, in antenatal departments. Fig. 7 illustrates a large general clinic where many patients have to undress. To avoid keeping the doctors waiting, a large number of cubicles is provided, grouped round each consulting room. The general waiting room, attached to which are lavatories for each sex, leads to the departmental waiting room; from this room the patient enters the consulting room and, if necessary, is shown into a dressing cubicle, where he or she undresses and waits until the consulting room is again free. After seeing the doctor the patient returns to his cubicle, dresses and enters the main circulation without re-entering the consulting room. In some schemes the consulting rooms are earmarked for one sex and consequently duplicated as shown, but in other schemes men and women use both consulting rooms, but attend at different times or on different days. Also in some schemes each consulting room has a group of dressing cubicles on each side, so that both sexes may be dealt with at once. For children's use, especially for infants in charge of parents, a room without cubicles or similar divisions is sometimes provided for undressing. The sizes of the cubicles are approximately 3ft. by 5ft. A door giving direct access from the consulting room to the corridor without entering either the waiting room or the undressing room is sometimes provided for the use of the doctor and nurses, but as an assistance to better and obvious circulation for patients it may be considered wise to omit such doors as in the example.

### Tuberculosis Department

This department, when separate, usually follows very closely the layout suggested for a general medical department as outlined above and in Fig. 7. In all larger clinics having a separate department for this purpose a separate waiting room should be provided. The waiting room should give access to a corridor from which are approached the nurses' room, dressing rooms and consultation rooms. A typical layout is to place a nurses' room centrally in a group of five rooms with a dressing room on each side of this central room, so that the nurses have control of the dressing rooms through a connecting door. Beyond each dressing room are placed the consulting rooms. Each dressing room in a busy clinic will require some six or seven cubicles to serve each consulting room.

### X-ray Department

Small clinics are seldom provided with X-ray apparatus, and if this service is needed for patients, the latter either go to a central or main clinic or to a local hospital. In larger clinic schemes, however, the provision of X-ray is becoming general, not only for examination of patients but also for X-ray treatment. Certain precautions have to be taken to protect surrounding rooms from the penetrating effects of the X-rays, either by the use of lead lining to the walls, floor and ceilings, or by using barium plaster in similar positions, the former being an essential precaution for some types of apparatus; such protection does not, however, affect the actual planning of the building to any very great extent. Although much of the work is carried out in normal daylight, light-tight blinds are usually needed in the main apparatus room. Most, if not all of the equipment, is usually placed in the X-ray

room itself, but in some schemes a part is separated and placed in an operator's room adjoining the X-ray room and overlooking it by means of a small window about 20in. by 15in., which is protected by lead-compound glass.

The size of the actual X-ray room is dependent mainly on the type and nature of the equipment needed for the particular scheme. Rooms vary in size from about 250sq. ft. in area upwards, many rooms being about 350sq. ft. to 400sq. ft. It is desirable for the room to have one external wall in order to have natural daylight. The walls surrounding the whole department are generally at least 9in. thick. Corridors and doorways leading to an X-ray room should be sufficiently wide for stretchers to be handled easily.

In addition to the X-ray room itself there should be a number of auxiliary rooms. Leading directly out of the apparatus room should be a dark room, and in addition a patients' dressing room with cubicles. A waiting room is often provided where patients wait until they are required and during the time necessary for the development of photographs, to ascertain that results are satisfactory. The dark room should be connected with the X-ray room either by a dark lobby with two doors or by means of a special light-tight lobby without doors. The dark room should have a floor area of at least 50sq. ft., and preferably rather more. The equipment of the dark room is usually very simple, and consists of a long bench or benches to form work tables, and a suitably large sink; a number of shelves and racks is usually provided for storage of plate holders, chemicals and other supplies. A film store is needed, and should be planned with approach from the external air to eliminate fire risks; this store should be enclosed in fire-resisting materials, and its equipment is composed of shelves and racks of various sizes to suit the materials to be stored.

The waiting room is normal and similar to those needed for other departments. The dressing room should be fitted with several cubicles as already outlined for other departments.

Fig. 8 illustrates a typical X-ray department. This figure shows clearly which rooms need natural light, and is in this example a separate wing

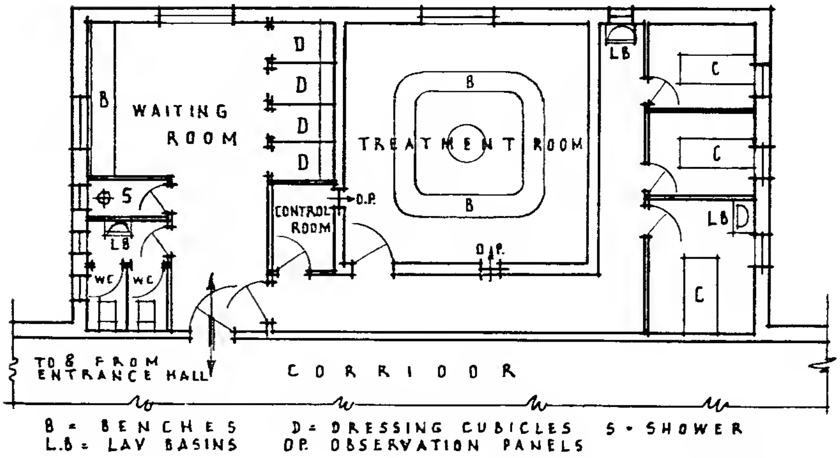



Fig. 6 Light treatment department

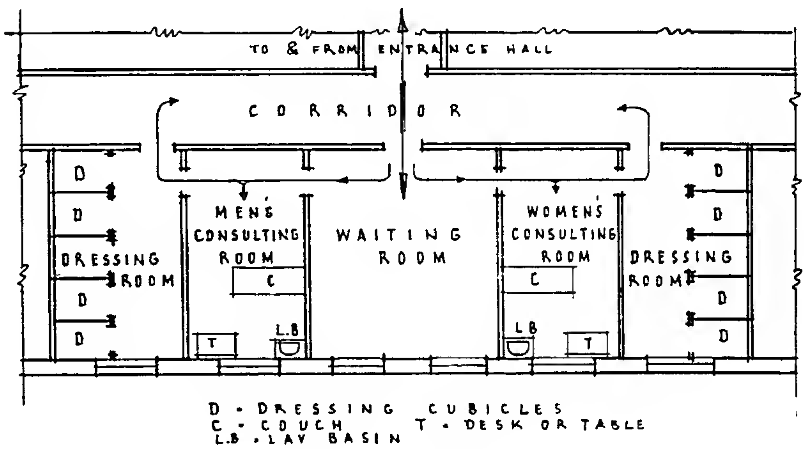



Fig. 7 General medical department

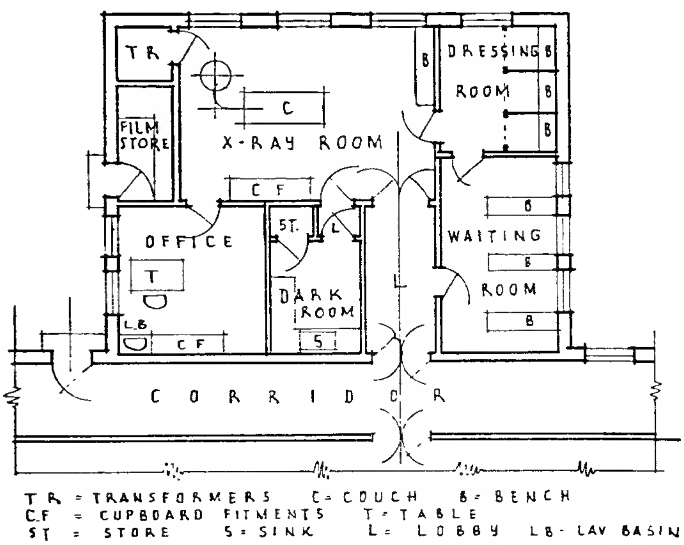



Fig. 8 X-ray department

attached to the main circulation corridor. The arrangement shown takes advantage of the three external walls for the placing of the main rooms, and at the same time the film store is placed conveniently near the department and is reached from the main corridor. The entrance from the main circulation is a wide corridor leading directly into the X-ray room for the easy handling of stretchers. Normally, patients enter the waiting room and pass to be X-rayed by way of the dressing room. Thus all the rooms to which patients go are close together, leaving the staff rooms together in another group.

**Remedial Exercises**

A room is often required for this purpose, and is generally similar to a normal gymnasium on a small scale. The equipment consists of the usual gymnastic apparatus, such as wall bars and beams as used in schools. The room should have an area of at least 400sq. ft., and it is desirable that the height be not less than 10ft., but it is better if much greater height can be provided up to about 16ft.

In some schemes part of the main waiting hall is used at certain times as a gymnasium; if space permits, the waiting hall may be provided with a folding screen to cut off the gymnasium portion, so that the two resulting parts may be used simultaneously, or, on occasion, the whole area may be used as a general waiting room.

**Dispensary**

Many clinics do not require dispensaries, as all medicines are made up by outside chemists. The larger schemes, however, can usually justify the employment of a full-time dispenser and consequently need a room or rooms for the purpose. A single room is sufficient for all but the largest clinics, which have, in addition, a store room. Good daylight is desirable. The equipment consists of a serving hatch for communication with the patients, a long working bench, one or two sinks, several cupboards and drawers and a large amount of shelving. The dispensary should be placed near the main patients' circulation on the route from consulting rooms to the main exit of the building. Waiting space is essential either in the main waiting hall or preferably in larger schemes provided independently near the dispensary.

**Food Sales**

A small room having an area of 70sq. ft. to 100sq. ft. is often needed for the sale of special invalid foods. This room should have a small service counter or hatch connected either to the waiting hall or to a recess formed in the main circulation corridor. The room needs to be fitted with a large amount of strong shelving of various sizes, and in large schemes a store room may be needed in addition. The floor area must be large enough for unpacking large cases, and also doors should not be too narrow to allow a normal packing-case on a trolley to pass through.

**Refreshments**

When refreshments are provided for sale to waiting patients, they are of a fairly simple nature and do not call for elaborate equipment. A small combined kitchen-servery, depending on anticipated numbers as to its size, will usually be found to be adequate. The equipment needed is generally a gas or electric cooker, tea urns, sink, draining board, refrigerator and considerable storage space for china and general storage, including food.

# Crematoria

## INTRODUCTION, SITE, PLANNING

### Introduction

There has been a very great increase in recent years in the number of persons desiring cremation. The Cremation Act, 1902, allows burial authorities (including local authorities) maintaining a cemetery under the Public Health (Interments) Act, 1879, to provide and maintain crematoria.

The first crematorium was opened in this country about 1885, at Woking in Surrey, and was followed by a number of others in various parts of the country during the next 20 years. Several of the earlier schemes were private undertakings, but some were operated by municipalities. Prior to the 1939–45 war there was a rapid increase in cremation and new crematoria were built in many parts of the country; among the recent schemes put forward many are in conjunction with municipally-owned cemeteries, or are additions to the work of municipal cemetery committees.

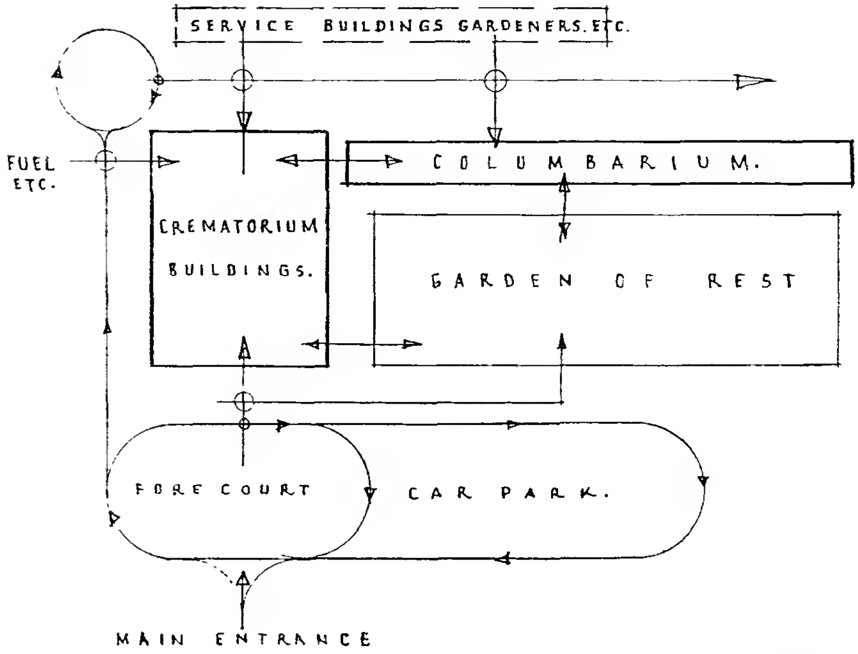



Fig. 1 Site analysis plan

### The Site

The selection of a site for a crematorium does not often rest with the architect, although it should be given adequate consideration in town-planning schemes. No crematorium may be constructed within 200yds. of a dwelling-house without the consent of the owner and/or the occupier of the house, nor within 50yds. of the public highway; nor may it be placed in the consecrated part of the burial ground of any burial authority. There is nothing about cremation or crematoria which is detrimental to a district, such as smoke, fumes or noise; nor is there the same appearance as a cemetery, since it is usual to enclose most of the site from public view with either walls or tree screens. Also, compared with a cemetery, the area necessary is very much smaller. Sites should, however, be selected which will permit of a large open space or "garden of rest," columbaria and cloister-space sufficient to house the urns and memorials of the cremated over a very long period.

### General Planning

Fig. 1 illustrates in diagram form the essential circulations and relationships of the various parts of a crematorium scheme. It is most satisfactory to have one main entrance through which all persons and vehicles pass when going either to the crematorium or to the columbaria and garden of rest; but if there is likely to be continuous use and consequently very much traffic, it is sometimes better for vehicles to leave the site by a separate gate, although this involves duplication of control. The buildings should be sufficiently set back to permit the easy handling of vehicles and must be so arranged that vehicles proceeding to the main entrance to the crematorium are parallel with the entrance when stopping to set down passengers or to remove coffins from hearses. Ample car-park facilities within the site are essential and should be arranged in such a way that vehicles proceed easily to the park after setting down their passengers and can move away quickly from the car-park to the crematorium door to pick up their passengers after the ceremony. Vehicles other than those connected with deliveries and services only require access to the crematorium main doorway, or to set down passengers wishing to proceed to the garden of rest; the entrance courtyard and car-park should therefore be cut off from the remainder of the site, preferably by a wall, which may merely be a garden wall, or which may be part of the cloisters or columbaria. A service entrance is needed for fuel deliveries, if solid fuel is used and for services in connection with the building (repairs and extensions), gardens and for work connected with the erection of memorials and additions to the columbaria.

The diagram does not make any reference to offices or administration rooms, though such rooms may be required at the crematorium itself. Frequently, however, offices are in a more central situation in the town, in order to be more convenient for those having business with the crematorium authorities. Sometimes there are already offices in conjunction with an existing cemetery authority.

Fig. 1 does not show any detail in regard to the crematorium itself, but it may be seen that access is required from the building to the garden of rest, and also from the furnace-chamber end to the columbaria and garden. It must be possible also to gain access to the garden without entering the building.

The garden of rest is an open space, usually mainly of grass, but having some planting to make it attractive especially in the form of trees near the boundaries. It is used for scattering the ashes of cremated persons—unless they are to be retained in an urn or

are to be disposed of elsewhere, such as by burial. It is not usual to provide burial or grave space within the precincts of a crematorium in this country, although it is a general practice in some other countries. In some gardens, however, sites may be acquired for the erection of private memorials.

Covered cloisters are used to provide wall space to which memorial tablets may be affixed. These cloisters also provide covered space in which flowers may be assembled, and in which the people attending cremations may wait before and after the ceremony. Columbaria, which are permanent resting-places for the urns, may take a variety of forms and will be discussed later.

The principal compartment of the plan of a crematorium is the chapel, which should be approached directly from the entrance doors through an entrance vestibule; it is general to orientate chapels so that the catafalque is at the east end, although crematoria are usually unconnected with any religion. The Cremation Act, 1902, exempts ministers of religion from the obligation to perform a burial service at or after the cremation of remains of any person. The body to be cremated is brought into the chapel, and rests on the catafalque during the service, after which it is passed into the transfer chamber. This room is used for preparing the coffin and its contents for transmission into the furnace, as, for instance, the removal of palls or other draperies and flowers. From the transfer room the body is moved into the furnace room, where the cremation takes place.

Other essential rooms attached to the three main rooms outlined above are waiting-rooms, for mourners, vestry for clergy, offices, viewing room, urn store, heating chamber and fuel storage for the buildings and fuel storage or meters for the furnaces, depending on the fuel used for cremations. A small staff-room, lavatory and cleaners' store are usually needed.

At the entrance to the building there should be a long loggia or covered space. It is desirable that this should be very long, so that several vehicles may set down passengers under cover at the same time. There are usually a number of vehicles bringing the more important mourners of the funeral cortège, all of which may arrive together.

The waiting-rooms should be placed adjoining the entrance vestibule and have, if possible, separate approach from the entrance loggia in addition to the internal approach. Lavatories and W.C.s for both sexes should adjoin, or be placed very close to, the waiting-rooms. The vestry should have a separate approach from outside in addition to a door to the entrance vestibule or direct to the chapel. The vestry requires a lavatory and W.C. attached.

### Plan Analysis

Fig. 2 illustrates the essential rooms which go to make up the plan of the main crematorium buildings, together with the relationship of the rooms to one another and the main circulations.

The coffin and the mourners arrive at the entrance, and should be able to proceed as easily as possible to the chapel through a main entrance vestibule. The waiting-rooms and vestry should have direct access to the vestibule, so that waiting mourners and clergy may meet the cortège as it reaches the vestibule. The chapel, transfer chamber and furnace room must be attached to each other as the coffin passes from the first to the last through the transfer chamber; although these three rooms adjoin, they need not necessarily be on the same axis, as for example, on Fig. 2; this point will be discussed in detail later in this section.

Adjoining the transfer chamber there should be a room or lobby from which the transfer of the body may be viewed by representatives of the family of the deceased. Consequently access is required from the chapel to the viewing room, but in addition external access should be provided. A door in the chapel is also desirable giving access to the garden of rest or to cloisters through which the mourners may pass after the service if they wish to see the wreaths which are removed from the coffin before the cremation takes place and to enable them to disperse so that the chapel may be used again within a short time for a further service. This door may, if desired, be incorporated in the plan as a secondary entrance coupled with the access to the viewing room.

Adjoining the transfer room there is usually a room for the storage of urns, both those for use and those which contain ashes awaiting removal to the columbarium or elsewhere. The urn store should also have direct communication with the furnace room.

The vestry can be a small room, about 100sq. ft. to 150sq. ft. in area, in which officiating clergy may put on vestments and await the arrival of the hearse and mourners. It is important that it should have external approach either from the main entrance loggia, as shown on Fig. 2, or by means of a separate entrance vestibule or lobby. It should be possible to see the arrival of the funeral cortège from the vestry, so that the clergy may leave the vestry and meet the coffin at the entrance at the moment of arrival.

### Main Entrance

Fig. 3 illustrates two typical main entrances giving access to the chapel. Type A has a porch over the actual doorway itself, and Type B is in the form of a *porte cochère*, thus providing a considerable length of covered space. It is desirable that at least sufficient space in which to remove the coffin from the hearse should be under cover, especially for protection in wet weather; the vehicles containing the mourners may then follow the hearse into the covered space to set down passengers. If a completely covered space is not provided, some form of porch is useful as a protection, since the entrance doors must remain open for long periods. Both diagrams on Fig. 3 indicate wide approach steps at which vehicles may draw up. One step only is desirable at the entrance, to act merely as a pavement for limitation of vehicular traffic space and to ensure that sufficient room is left for pedestrians and for turning the coffin when it leaves the hearse to enter the building; this step or pavement should not be less than 3ft. wide. The length of the *porte cochère* in Diagram B, or pavement each side of the porch in Diagram A should not be less than 34ft. if proper space is to be provided for the hearse (with space to remove the coffin) and at least one other vehicle. A hearse is usually 16ft. to 18ft. long, and requires a space behind it of at least 9ft. 6in. for removing and turning the coffin. The *porte cochère* type, whether it is as long as is suggested on Diagram B, or merely provides a covered length of about 10ft. under which the coffin may be removed followed by the setting down of

mourners from other vehicles, has very many advantages over a porch type, particularly if the porch is not open at the sides, as indicated on Diagram A; if the porch is enclosed by walls at the sides, a further pavement space must be provided in front of it for pedestrian access each side.

Approach steps and, in fact, all other steps, except perhaps near the catafalque, should be avoided, since it is difficult to carry a coffin up steps. If steps are used, the sizes should be about 4½in. or 5in. for risers and about 15in. for treads, so that the ascent is as gradual and easy as possible. Unless a *porte cochère* is used, piers or supports carrying roofs over the entrance should be avoided, or else set back sufficiently far to prevent doors of vehicles from being damaged when opened, or from not opening sufficiently to allow passengers to leave the vehicle.

A *porte cochère* should not be less than 11ft. wide between the building and the inside face of the outer supports when the pavement or standing space is 8ft. wide, but it is very much better to allow for a roadway 9ft. wide and a pavement 4ft. wide; the outer row of supports should be placed on a pavement as a protection against damage to or by vehicles.

## Entrance Doors

Entrance doors and any other doors that may be needed between the entrance and the catafalque should not be less than 6ft. wide in the clear to allow pairs of bearers carrying a coffin to pass through easily. More than normal height is not required for doors, as the coffins are carried shoulder high. Doors should be designed to open in either of the ways shown on Fig. 3 in order to avoid any risk of bearers or mourners catching their clothes on projections such as handles.

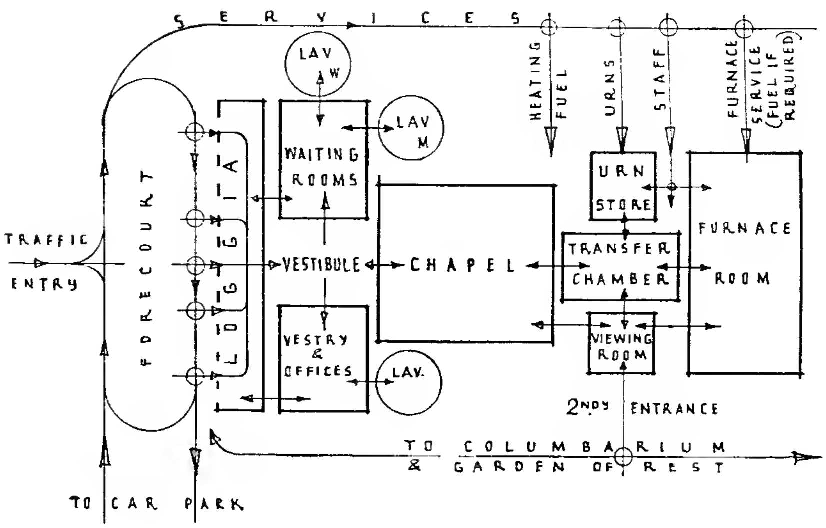
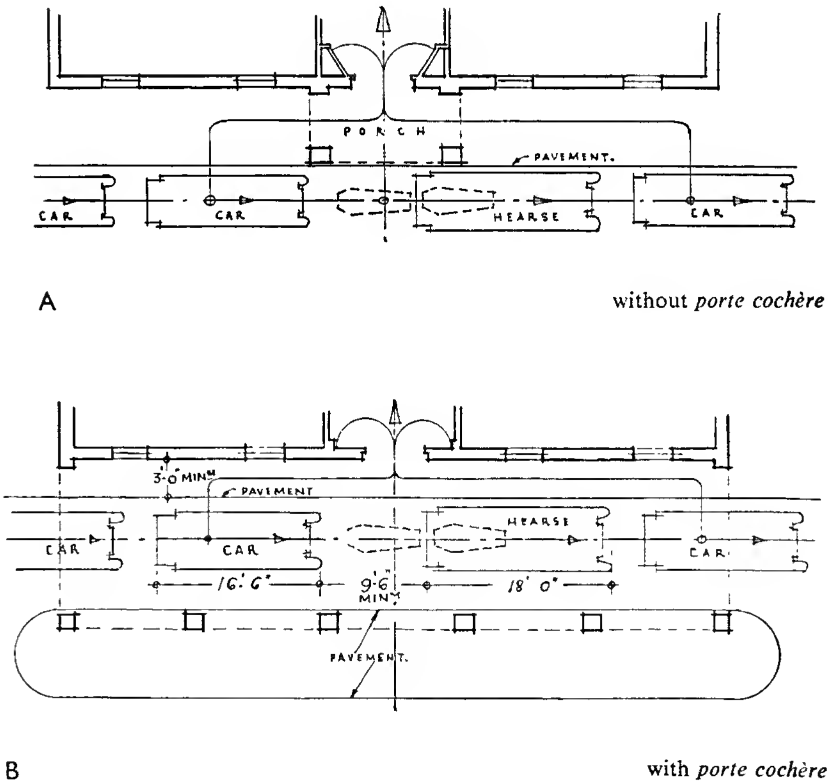



Fig. 2 Plan analysis




without *porte cochère*

with *porte cochère*

Fig. 3 Main entrance

## CHAPELS

### The Chapel

The chapel has to provide sufficient floor space for the seating, clergy desk and the catafalque. The amount of seating required seems to vary considerably, some chapels having only about 50 seats and others as many as 200 or more, while some continental examples are very much larger. The seating may be either in the form of fixed seats or pews, or chairs; the amount of floor space required for either type is approximately the same, and should be based on an allowance of 5sq. ft., exclusive of gangways and similar clear spaces, although actually chairs require less space than fixed seating. The main gangway leading from the entrance to the catafalque should be at least 6ft. wide in the clear between seat ends or chairs to allow sufficient space for the coffin and bearers on each side.

The clergy do not generally require any fixed or special seating, and, indeed, often no seating provision whatsoever is made for them. A reading desk or lectern is required near the catafalque, from which the funeral service is conducted.

The chapel should be rectangular in shape, based on a plan shape usually adopted for ecclesiastical buildings. Good light is essential, and the general shape and finish of the room should depend on good proportion of height to length and breadth, avoiding elaborate decoration. Care should be taken to avoid a decorative scheme which is depressing, although a subdued and restful atmosphere is desirable. The climax of the decorative scheme should be the catafalque itself, on which the coffin is placed during the service.

There is a variety of ways in which the layout may be arranged in relation to the catafalque, which must adjoin the transfer or ante-chamber leading to the furnace or incinerating chamber. The transfer chamber may either be at the same level as the chapel or at a lower level; thus the coffin either slides horizontally into the transfer room from the catafalque, or descends to it on a lift. Both systems have been used in many schemes and appear to work equally well, each having advantages and disadvantages. The lift type involves the difficulty of closing the opening in the catafalque after the coffin has descended, while the other type requires care in planning to avoid a possible view through the doors when the coffin is passing through into the transfer room. Figs. 4 and 5 illustrate a number of general layout plans of chapels, showing the positions of the catafalque in each example. Few chapels make any provision for an altar or similar ecclesiastical fittings, principally because crematoria are non-denominational and not controlled or operated by religious bodies, although there are some examples where an altar is provided behind the catafalque or at the end of the chapel when the catafalque is placed on a side wall. It is possible to provide an altar in a recess which can be closed by doors or curtains when not required. Example A on Fig. 4 shows the catafalque at the end of the chapel, with the door to the transfer chamber on the central axis; great care has to be taken to design in keeping with the chapel, those portions of the transfer room which can be seen from any part of the chapel when the connecting doors are open, so as to continue the same decorative atmosphere. The doors between the chapel and the ante-chamber are generally of metal and a curtain is often hung behind them; this system does not seem so good as some of the others which are discussed later. The catafalque may be of wood, stone or metal, and is usually raised on one or two steps above the general floor level of the chapel. In the top of those types on which the coffin moves horizontally are fixed rollers and other apparatus to move the coffin silently into the ante-chamber when required during the service; the catafalque in this type requires to be about 10ft. long and 3ft. 6in. wide, although many are of larger sizes. It is essential that the coffin should be in full view of the mourners in the chapel and this is plainly impossible in plans such as that shown on Fig. 5, Diagram A. The top of the catafalque is usually about 3ft. 9in. or 4ft. above the floor level surrounding it, since, if it is at a lower height, the difficulties of the coffin bearers increase. In those types with the ante-room below the level of the chapel the catafalque does not need to be quite so long as suggested above, since the centre part is a lift platform which moves and only requires the necessary screen wall thickness around it. The scheme shown in Fig. 4 B, is based on a descending catafalque, and like Type A in Fig. 4, is on the main axis of the chapel, but overcomes the difficulties of the view into the ante-chamber. The example shown in Fig. 4 C, seems to be one of the best solutions of the problem when the catafalque is placed on the axis, and it applies equally well to both vertical or horizontal transfer of the coffin. It is based on placing the catafalque in a recess which can be closed from the chapel by curtains which draw slowly across at the requisite moment in the service before the coffin moves from the catafalque; after the curtains are drawn the coffin may be removed as desired to the furnace room by either of the alternative positions shown on the figure. The curtain avoids the sight of the automatic movement of the coffin either vertically or horizontally and gives an increased impression of finality to the service.

Types A and B on Fig. 5 have the catafalque placed on the side wall of the chapel; this removes the possibility of seeing very directly into the transfer room when the doors open for the coffin to pass through. Type B seems better than Type A in some respects, since in Type A the coffin is not in full view of many of the seats in the chapel, although it may be claimed that the transfer chamber is more satisfactorily shielded.

Type C is an alternative plan based on a change of axis; the catafalque is placed on the short axis of the chapel with the seats facing towards it, while the entrance is on the end of the chapel. This scheme allows the mourners to pass to the seats without interrupting the passage of the coffin, by using the side and back gangways. It does not, however, give a much better view of the catafalque than is afforded in Type A of the same figure.

Each example shows the placing of the necessary access doors from the chapel to the transfer chamber and to the cloisters and garden; it will be noticed that the positions have to vary according to the position of the catafalque and that those solutions in which the catafalque is set back, as for example, Fig. 4, B and C, have the advantage that mourners do not have to pass near to the empty catafalque after the service.

As regards seating, side and back gangways, as shown in Fig. 4 B and Fig. 5 C, are advantageous in allowing mourners to enter and leave more

easily and with less disturbance to a solemn atmosphere.

The chapel is usually lit from side windows placed well above floor level in such a position that they do not interrupt any dado which may be used on the side walls. A minimum height of 7ft. above the floor to the sill is advisable for acoustic and other reasons. It is important that no window is placed on the same axis as the catafalque if it faces the public when seated or standing during the service. It is particularly desirable that adequate natural lighting should be planned to fall on to the catafalque; when the catafalque is placed on a side wall, a window may be placed on its axis, but when the catafalque is on the main central axis of the chapel, windows should be designed on one or both sides.

For reasons of good acoustics, ceilings should not be more than 30ft. above the floor level of the chapel and are better at lower levels in small buildings, although care should be taken to avoid any feeling of insufficient height. If curved ceilings are used, it is important that the centre of the radius be below the floor level. For similar reasons elaborate or broken-up ceilings should be avoided. In connection with chapel heights it should be remembered that an organ is often installed, and it may be advantageous to place this at a gallery level; in a height of 30ft. it is possible to provide an organ in a gallery placed at such a level as to allow clear headroom of 9ft., so that it may be over the entrance doors to the chapel if desired. The blower plant is often placed in the basement. Sizes of organs vary very much according to the requirements and it is consequently impossible to give useful dimensions in these articles.

Fig. 6 illustrates a typical section of a crematorium chapel having a curved ceiling. The catafalque is placed about 3ft. 9in. above the normal floor level surrounding it, although one or more steps may be incorporated in the design of this fitting so long as they do not interfere with the coffin bearers when the coffin is being deposited on the catafalque. In some schemes in which the coffin is lowered to a basement furnace chamber, the top of the catafalque is at a much lower level; some examples show as little as 12in. above the floor, but this is undesirable, since it is much more difficult for the bearers to place a coffin on a catafalque at a low level

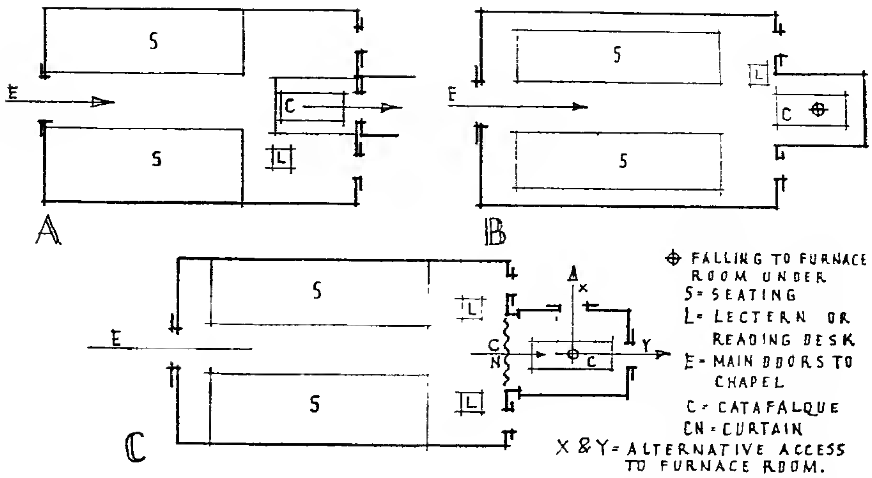



Fig. 4 Layouts for chapels

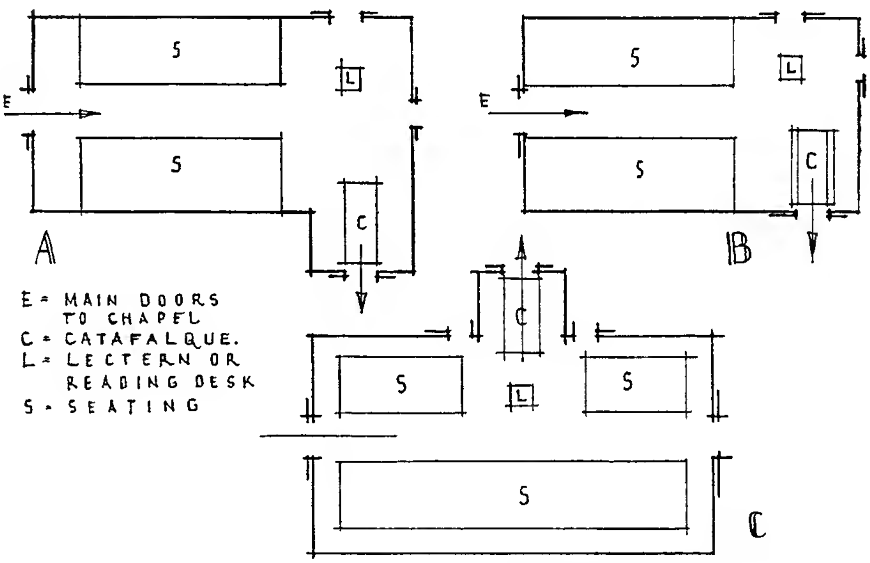



Fig. 5 Alternative layouts for chapels

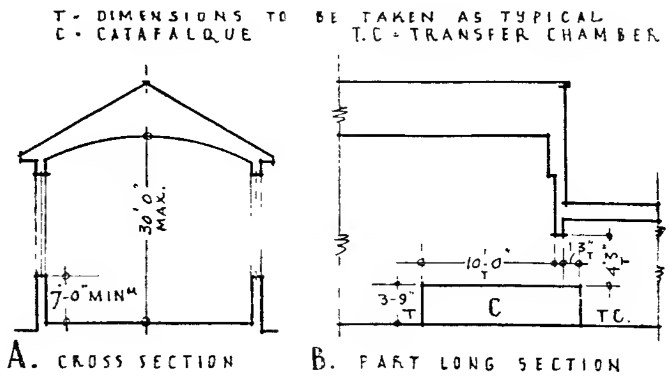



Fig. 6 Chapel sections

than at a level nearer to normal shoulder-height.

Organs are quite a usual requirement in crematoria and are placed in various positions according to the plan and decorative scheme adopted; when placed in a gallery, space is required for an access staircase outside the chapel itself. If the organist cannot see the entrance, some means of communication such as a bell or buzzer is necessary between the attendant at the door and the organ. A similar means of communication is required from the clergy reading-desk to the transfer chamber to indicate at what point in the service the coffin is to be moved into the transfer chamber.

### Transfer Chamber and Furnace Room

In some schemes only one room is provided for the dual purpose, but it seems desirable that separate rooms, divided by a screen wall, should be arranged, so that representatives of the deceased person may view the transfer of the body to the furnace without seeing the entire apparatus, which is of a practical nature and consequently unattractive in appearance. When two rooms are provided, the transfer or committal room is decorated simply but in character with the chapel, bearing in mind that representatives of the deceased may come into this room; the furnace chamber, on the other hand, is purely utilitarian in design. The doors of the furnace chamber only show in the transfer chamber. It seems general in most recent crematoria to provide two furnaces, and these are usually so placed that they are not in view when the door behind the catafalque is opened, although this is usually carefully curtained. The placing of the furnaces is to some extent dependent on the type of fuel to be used and the position of the flues; when overhead flues are used they may be placed so that there is at least 3ft. between furnaces, or between furnaces and walls or flues, in order to give access to controls and supplies at the sides of furnaces.

Various fuels are used for the furnaces, such as coal, coke, oil, gas and electricity; the most usual fuel in this country in recent installations appears to be gas, which is claimed to be the most easily handled and the most economical.

Furnaces seem to vary considerably in size according to each manufacturer, even when similar fuel is used; for example, a gas furnace by one manufacturer is about 7ft. 6in. wide, 11ft. long and 8ft. high, whereas another manufacturer makes one about 6ft. 3in. wide, 9ft. 9in. long and 13ft. in height. Typical sizes of three furnace chambers each having two furnaces installed are: 18ft. 9in. by 33ft. 6in., 20ft. 6in. by 29ft. 6in., and 28ft. by 30ft.—an indication of the considerable variations in dimensions which may be encountered. Fig. 7 illustrates what seem to be good and adequate dimensions for a furnace chamber without a separate transfer chamber; in this example there is a central flue with an incinerator on each side. At least 10ft., and better 12ft., must be provided between the wall through which the coffin enters from the catafalque and the faces of the furnaces; in this space the trucks or trolleys on which the coffin is placed as it leaves the catafalque have to be turned and moved directly in front of the furnace doors. This dimension of 10ft. or 12ft. is therefore the minimum space required for a transfer chamber when it is provided separately from the furnace chamber.

It is desirable to have a space about 8ft. wide at the back of the furnaces and in addition there must be two or three small rooms or annexes in which may be placed an urn store, fan chamber and meter room. In addition to the 8ft. behind the furnace, it is also desirable to have space for a wide work-bench as suggested in Fig. 7. The flue required from the furnaces may be taken anywhere desired, but it should provide about 35ft. of height above the furnace room floor level. This flue is usually incorporated into some part of the external treatment of the building, such as a tower. By the use of modern types of furnaces smoke is practically, if not entirely, eliminated and is unnoticeable from the exterior of the building.

Fig. 8 shows a typical scheme with a separate transfer chamber. Access from the transfer chamber to the furnace room must be provided; in this example a pass door is provided between the two compartments. As an alternative to Fig. 7, this diagram shows the flues gathered to a main flue on one side of the furnace room; a space of 4ft. to 6ft. must be allowed between the furnaces where access is required between them, as in Fig. 8. When schemes without transfer chambers are adopted, it is desirable to avoid doors connecting directly with the chapel as shown in Fig. 7; either lobbies should be formed within the furnace chamber or else access should be provided by some other means.

### The Columbarium

There are various methods of disposal of the ashes following cremation; one of the most general methods is to scatter the ashes in a Garden of Remembrance, and it is said that at least one-half of the ashes of those cremated are disposed of by this means. A few people still prefer to dispose of the urns containing the ashes by burial, and some ground—although usually only a small area—is often set aside for this purpose. Many persons prefer, however, to preserve the ashes in urns above the ground and special buildings called columbaria have to be provided for this purpose.

Of the various types of columbaria, some are enclosed buildings, while others are of the open-sided cloister type of building.

The urns used for the preservation of ashes are of many types and sizes, and some examples are of very elaborate design in marble, alabaster or bronze; the most usual type is that known as the " box " type, which is rectangular in general shape and of rather greater length than depth. The columbarium has to provide niches or shelves in or on which the urns rest. In view of the fact that the box type of urn is most usual, the majority of the niches should be designed to hold them, with a space about 18in. wide, 18in. high and 12in. to 14in. in depth. However, there must also be provision for urns of other shapes, some of which need heights of 2ft. and more. Provision should also be made for groups of urns belonging to members of one family, with accommodation for four and six urns.

The shelving or niches may be made of any solid and permanent material such as brick, stone or marble. In some countries abroad, where cremation is more usual than in this country, columbaria of many different types exist, some of which are most elaborate in the types of niches provided; examples are to be found of brickwork in which are formed regular rectangular niches as urn containers, the front of

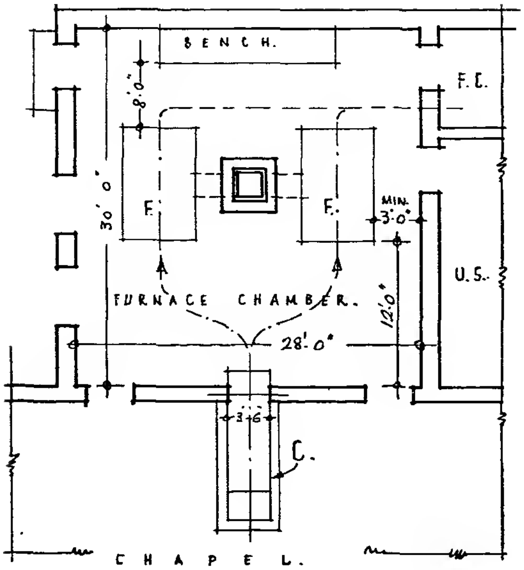
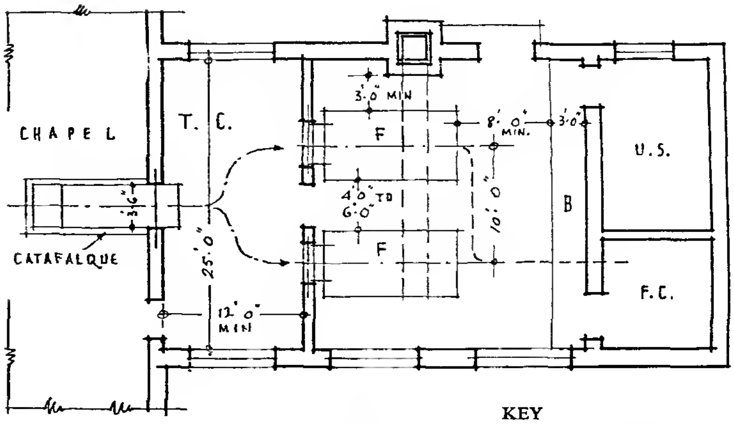



Fig. 7 The furnace chamber

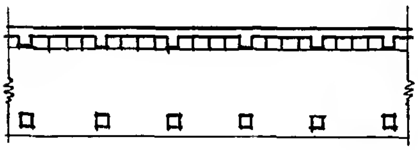



KEY

| | |
|---|---|
| F—furnace | TC—transfer chamber |
| F.C.—fan chamber | U.S.—urn store |
| C—catafalque | B—bench |

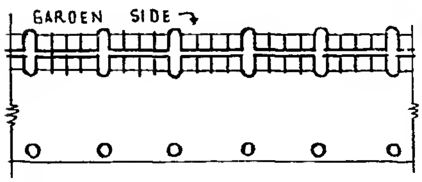
Note: height required is between 8ft. 0in. and 13ft. 0in. All dimensions depend on type of apparatus used

Fig. 8 Transfer and furnace chambers



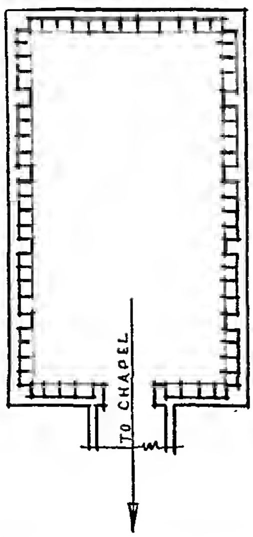
A

Cloister type



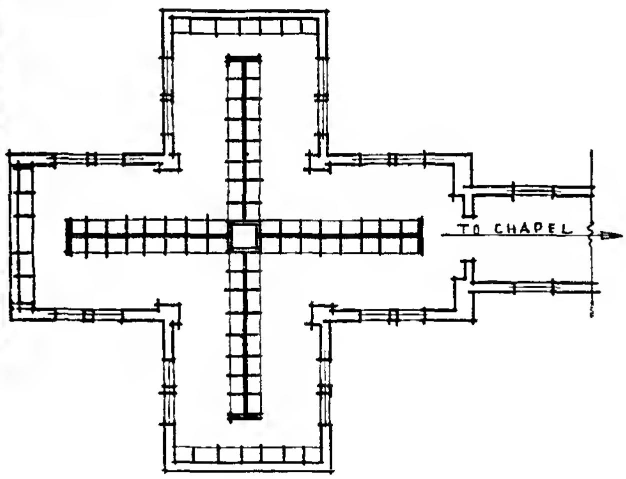

B

Combined cloister and garden type




C

Chamber type




D

Mausoleum type

Fig. 9 Different types of columbaria

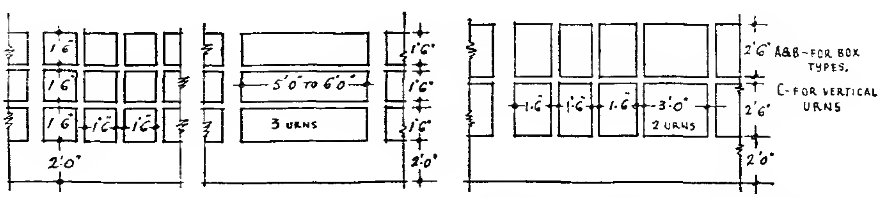



Fig. 10 Columbaria: dimensional data

the opening being covered with glass so that the urn may be seen, or by a slab of stone standardized in design on which the name of the deceased person is inscribed.

The important factor is to design the niches in such a manner that orderliness in appearance is controlled and maintained, but to provide at the same time for the varying requirements in the matter of shape and size.

Fig. 9 illustrates four types of columbaria. Diagram A shows the open cloister type with one side open to a garden—usually the Garden of Remembrance—but sometimes simply an enclosed courtyard or formal garden, with the niches or shelves for the urns against the inside wall; this cloister type has the advantage of providing covered walking and waiting space and may also be used for the display of wreaths and flowers. Diagram B illustrates a combined type, having a covered cloister on one side of the wall and niches on both sides, the second side being open to a garden. In the case of the use of niches in a wall not protected by a roof, it is desirable that, once the urns are placed in position, the front openings of the niches should be closed, as a protection from the effects of the weather, by slabs of stone or, at least, glass.

Types C and D are similar in so far as they are both enclosed buildings; the advantage of these types is that however much the designs of the urns vary, they do not detract from the general good design and orderliness of the grounds in which they are placed, since one must enter the building before seeing the display of urns. The main difference between the two examples is that in Type C the niches are placed round the outside walls, whereas in Type D they are grouped in the centre. A building of Type C must have the windows placed above the rows of niches, which are consequently placed in a bad light, whereas the light strikes directly on to the urns in Type D. Type D has, in addition, the advantage of distributing the visitors better and affording them more privacy, since they are not all assembled in the one central space as in Type C. Owing to the placing of the windows in Type C, a high building is necessitated. The fronts of the niches are sometimes left open and sometimes closed with stone, marble or glass slabs or metal grilles showing names, dates and other particulars of the deceased.

In placing the niches, it is advisable to place the lowest shelf at least 2ft. above the ground or floor level, and to limit the height of the top of the uppermost niches to about 7ft. 6in., in order that the inscriptions may be read without discomfort. Fig. 10 illustrates some typical arrangements of niches for columbaria.

### Memorials

Apart from the columbarium, space usually has to be provided for the fixing of memorial tablets; wall space for this purpose may be provided in corridor connections between units, in cloisters or on garden walls. Garden sites for large memorials are usually available in the grounds of the crematorium, either in the Garden of Rest or places specially allotted for the purpose. Cloisters not only provide space for memorial tablets, but are also very useful for the display of flowers immediately following a cremation and at other times. The display and care of flowers are most difficult problems, and need very careful consideration; relatives and friends like to send flowers not only at the time of the cremation, but also on other occasions, such as anniversaries and unfortunately it is most difficult to provide for the display of these flowers in an orderly manner, since they fade, or at least lose their freshness, very rapidly.

### Offices

When main offices exist elsewhere, it is generally necessary at least to provide accommodation for the superintendent in charge of the crematorium, its staff and its records. Three small rooms are the most satisfactory methods of arranging this accommodation. Firstly, an office to which the public and those having business at the crematorium may go; this should have a simple inquiry counter. Attached to the inquiry office should be a private room for the superintendent, with space for a desk and several chairs (120sq. ft.) and adjoining the private room and with access only from that room should be a record filing room, unless all or the majority of records are stored elsewhere, for example, at the main offices of the burial authority.

The necessary outbuildings for the use of gardeners, such as glasshouses, tool sheds and stores, should be hidden as much as possible from all parts of the grounds used by visitors by means of cloisters, garden walls and screens of trees and shrubs.

Often lodges or cottages are required for at least part of the staff, but the planning of these buildings does not call for special comment in this section, excepting that their grouping should be considered very carefully in relation to the other and main buildings of the crematorium itself.

INTRODUCTION, ORIENTATION, GENERAL PURPOSE BUILDINGS

## Introduction

Sports pavilions are required by many different organizations and vary much in type and size. It is intended, in the first place, to exclude from this section all reference to social clubs or country clubs, which are rather wider in their scope than mere games pavilions owing to the inclusion of such rooms as card rooms and special restaurant facilities of a more social type, and to discuss these types separately as the occasion arises. The first part of this section is therefore devoted to pavilions attached to clubs or schools playing such games as tennis, football, hockey, and cricket and to those required for croquet, bowls and similar games.

The requirements of pavilions vary from a single room with some sanitary accommodation to large buildings providing many changing-rooms with bathrooms, a tea room, committee room and caretaker's quarters. Some pavilions are also planned with terraces, verandas and tiers of seats for spectators.

There are few special points in regard to the placing of the buildings in relation to the site and the playing pitches; the most important factor is to place any pavilion accommodating spectators or scorers—for tennis or cricket, for example—so that the sun is behind the spectators during the time that the pavilion is mainly in use, in order to avoid glare and direct sunshine in the spectators' eyes. Large pavilion schemes accommodating and providing catering facilities for many players and their friends should have a service roadway for food and fuel deliveries. It is desirable that the pavilion should be placed in such a position in relation to a particular playing pitch as to give spectators the most satisfactory and comfortable view of the game. When there are several pitches the pavilion is generally related to the main playing pitch or the most important court.

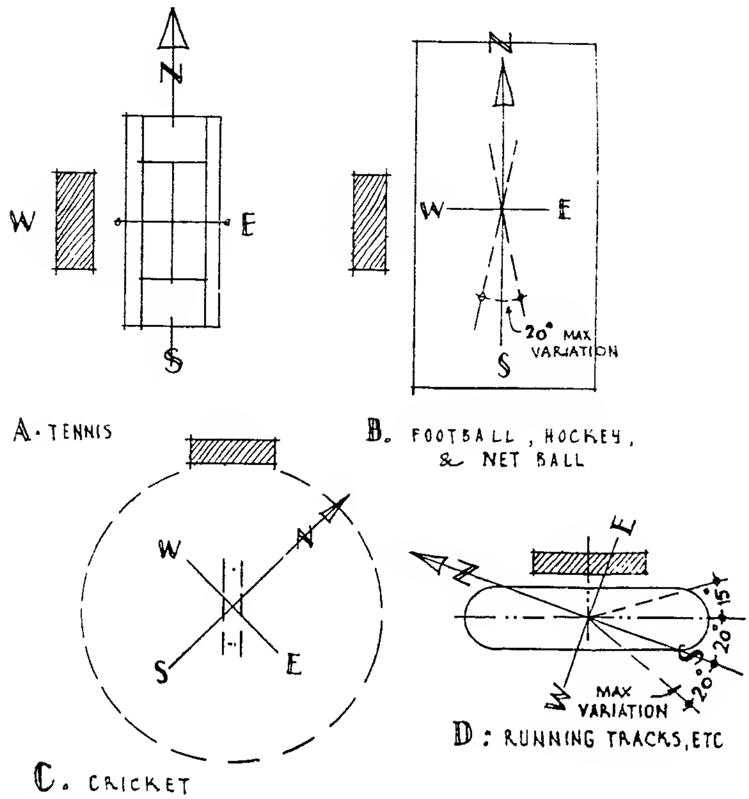



Fig. 1 Orientation of pavilions

## Orientation of Pavilions

Fig. 1 shows the positions of pavilions in relation to the main playing pitch usually considered to be the most satisfactory for the spectators or scorers. It is, however, difficult to place the pavilions to provide perfect conditions, as during the period of time that a pitch is mainly in use the sun may move through a large angle. Diagram A shows a tennis court which is usually used for important games during the afternoon; consequently, the pitch is placed with a north to south axis, and the pavilion on the west side, so that spectators' backs are towards the sun. In some clubs having special match courts, the principal spectators' stand is sometimes placed at the end of a court instead of at the side. Diagram B shows the placing general for such games as football, hockey and netball, which are mainly played during the early afternoon, when the sun is on the west side; the pitch, as for tennis, has its axis from north to south, and the pavilion placed on the west side. Diagram C shows a cricket pitch which is used during a longer period than is general for most games; a match may be played at any time from 11 a.m. until 8 p.m. or 9 p.m., so that it is better if the main axis of the pitch is placed from north-west to south-east, and the pavilion at the north-east end of the pitch.

## General Purpose Buildings

The smallest types of pavilions often consist of one large room fitted up with hat and coat pegs and possibly fixed wall seats. Such a pavilion is suitable only for games such as croquet, bowls and tennis, when the players change their shoes only and not their entire clothing. Some sanitary accommodation is always desirable even if it necessitates the use of earth or chemical closets; when sanitary accommodation is provided, there should be at least one W.C. for female players and one W.C. and some urinal space for men. It is an advantage to have a lavatory basin for each sex in the W.C.s if water is available. The W.C.s are frequently approached externally and not from the pavilion, in which case care must be taken to separate the approach for each sex and also to screen the entrances adequately. A very small kitchenette can often be incorporated at the back of the main room and entered from it. Fig. 2 shows an analysis of the essential requirements of pavilions of the smallest

types with externally approached W.C.s. Provision should be made in all types for the storage of the tools necessary to maintain the pitches, such as marking machines, mowers, forks, spades, etc., which must be kept under cover and locked to prevent theft. The winter storage of games apparatus such as posts and nets is often provided by using the main room of the pavilion.

Fig. 3 illustrates a type of pavilion in which the main room is much larger than in Fig. 2 and makes better provision for the service of teas and light refreshments. A secondary entrance is provided to the pavilion and especially for use in connection with the kitchen. A general store is provided as well as a tool room, the latter having external access only for the groundsman. An open-sided but covered veranda is suggested across the full length of the front of the building. The lavatories for each sex are at opposite ends of the building and so arranged that access is available both from the main room of the pavilion and also from the grounds, by way of the veranda. This type of pavilion, like that suggested in Fig. 2, is based on no provision being made for changing of clothes, and is therefore suitable only for certain games such as tennis, bowls and croquet.

Fig. 4 illustrates a pavilion where changing rooms are provided for only two teams: it is therefore suitable for a small club or school playing cricket, football, hockey or other similar games which involve a change of clothing. The pavilion suggested provides for one sex only in the changing rooms, unless members and visiting teams of each sex share the same changing room, which does not seem to be a regular practice. The main room serves as a general lounge and tea room and the remaining rooms are directly approached from it. The changing rooms can either both be placed on one side of the lounge or one on each side and have lavatories, baths and W.C.s attached and directly approached from them. The kitchen and service rooms need to be rather larger in area than those suggested in the previous figures, and it is desirable that they have a separate entrance for deliveries. An office for the groundsman or caretaker is suggested, but if this is not required the heating installation may be placed in this position. In the smaller schemes the amount of hot water needed can be heated by means of the kitchen range, or, if gas or electricity is available, by small boilers placed in the kitchen; but in larger schemes, particularly when large quantities of bath water are necessary, as for football players, a separate hot-water boiler together with fuel storage becomes necessary. Pavilions to be used in winter-time must have adequate heating facilities for the main room and open fires are very much appreciated. In clubs of importance it is also usual to heat the changing rooms, and a central heating system involving a boiler-room becomes almost essential. The amount of hot water required for washing and baths is usually very large, and the bulk is required for use within a very short time which involves hot-water storage tanks of large capacity, for which adequate space must be allowed in some suitable position in relation to the boiler and the fittings to be supplied.

In pavilions providing changing accommodation, and to be used mainly by one sex, provision should be made for a lavatory and W.C. for use of visitors and spectators of the opposite sex who may come to watch a game and stay afterwards to have tea with their friends.

Fig. 4 shows a position for the covered veranda which is almost a necessity in connection with some games—especially those played in the summer—and is very desirable as a covered and floored space for spectators in bad weather during the winter.

A plan similar in type to that shown in Fig. 4 can be developed as a two-storied building to provide for a second set of changing rooms and lavatories on an upper floor for the use of a second team and their visitors or for two teams of another sex. The approach to the changing rooms on the upper floor can be arranged by means of an external staircase or one from the entrance hall between the kitchen and the office leading to a balcony across the long side of the lounge, giving access to the changing rooms at each end; if the balcony approach is undesirable, a corridor could be formed over the kitchen and office outside the area occupied by the upper part of the lounge.

Fig. 5 illustrates a large type of pavilion providing accommodation for home and visiting teams of both sexes. The main room or lounge is used by both sexes as a general club and refreshment room, and, consequently, has adjoining it a kitchen which must be placed in a convenient position for deliveries as well as for service to the club room. Clubs of this size usually require an office, which is used primarily by a secretary and/or caterer. This can be used as a committee room, or, in addition to an office, a committee room is sometimes provided. Lavatories and W.C.s for each sex should be placed adjacent to the main club room for visitors other than players.

The main changing rooms may be approached directly from the club room, but are better if separated by a corridor, which may also serve as entrances. The changing rooms for member players and visiting players of each sex should be grouped together with their lavatories and should have complete cut-off from main circulations, as the corridors in each group are likely to be used by persons passing to and from the lavatories and the changing rooms. It is desirable in pavilions used by players of such games as football, in which the players are likely to become muddy, that they should have a separate entrance from the playing fields to the changing rooms without passing through the club rooms or main corridors, thus confining the dirt and mud to certain rooms. It is usual in most clubs to provide a large changing room for members of one sex, adjoining which is a series of smaller rooms for each visiting team of the same sex as indicated on Fig. 5; and it is equally usual to provide two separate lavatories, one for members and the other for visitors. The diagram suggests a plan based on a single-story building, with top light for certain of the less important rooms, mainly lavatories and corridors, but with all important rooms placed on the outside of the building; if, however, it is required, the same accommodation may be provided on two floors by duplication of the rooms of half the ground-floor plan on an upper floor and thus placing each sex on a separate level, except the main club room, which is used by both sexes. If a two-storied plan is adopted the club room may be two stories high without interference with the remainder of the rooms. It should be noted that the lavatories, which comprise basins, baths and W.C.s, are grouped together to facilitate services and supplies, while the necessary boiler-room may be planned in a basement directly below

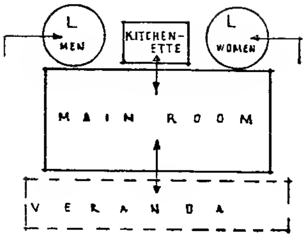



Fig. 2 Plan analysis (small club)

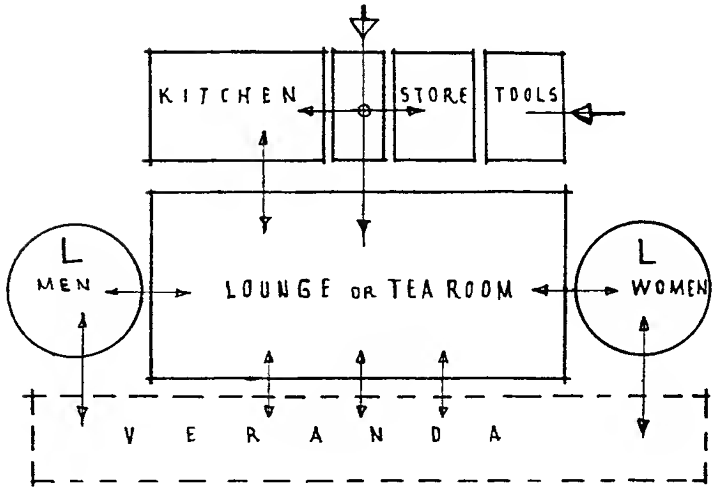
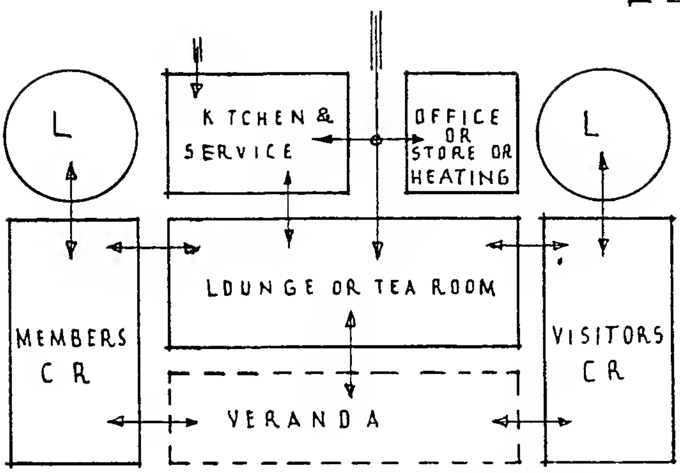



Fig. 3 Plan analysis (medium club)




KEY
CR—changing rooms
L — lavatories with W.C.s, basins and/or baths

Fig. 4 Plan analysis (medium club)

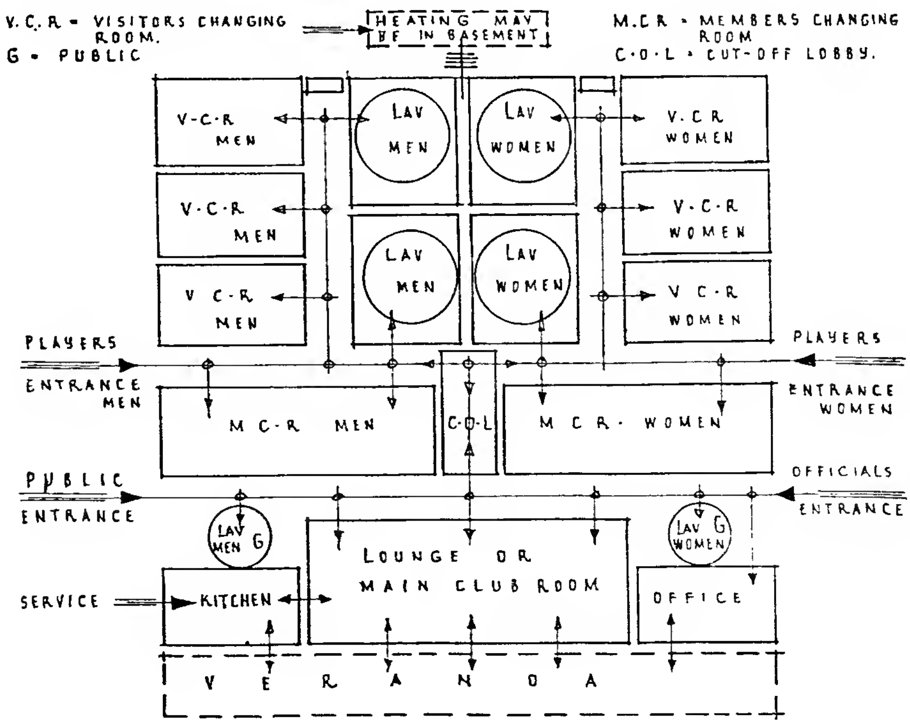



Fig. 5 A large mixed club

the rooms needing the largest amount of heat, namely, the lavatories and bathrooms, thus shortening pipe runs to a minimum.

### Changing Rooms

A changing room may only require just sufficient area for a certain number of persons to dress at one time and for pegs on which clothes may hang, with space for seats, but other rooms may require, in addition, locker space; the former type is sufficient for clubs where members or visitors bring their clothes with them, whereas the latter type is more suitable for those clubs where members leave at least a part of their sports clothing at the club between games, as, for instance, in many tennis clubs. Changing rooms without lockers should provide a floor area of at least 10sq. ft. per person in the better types of private club, but this figure may be reduced to about 7sq. ft. per person for children and for the smaller types of pavilion. It is usual to provide the changing space, together with the necessary seats and clothes-pegs, round the walls of the room, leaving the remainder of the floor space clear for circulation. When planning changing rooms it should be remembered that each person usually has a suitcase or other bag containing clothes and equipment, which occupies considerable space in addition to that needed in which to stand or sit while actually changing. As shown in Fig. 6 gangways between rows of seats with clothes-pegs over should not be less than 6ft. wide if seats are placed on both sides, and not less than 4ft. 6in. if seats are on one side only. The actual equipment, although very simple as regards essential requirements, may be provided in a variety of ways at very different costs. The essential needs are a number of clothes-pegs and some form of seat. Seats should provide at least 2ft. run per person; they are generally placed about 1ft. 5in. above the floor, and should be from 12in. to 18in. in width. Boot lockers or racks are often provided under the seats, but doors to these are of little value, and some authorities suggest that it is better to support the seats from the wall, and leave the space below the seat clear of all obstructions to facilitate cleaning, especially in rooms where considerable quantities of mud are likely to be introduced. Pegs should be fixed to wall battens, and it is preferable if each person is allotted two pegs of a hat and coat type. Seats are generally of wood, which should be chosen to be suitable for constant washing.

It is usual for pegs to be fixed about 6ft. above the floor. When island seats or racks for clothes are used, windows should be placed on the axis of the gangways, and not on the opposite wall, where light for the back rows is reduced by clothes which are hanging on the island stands.

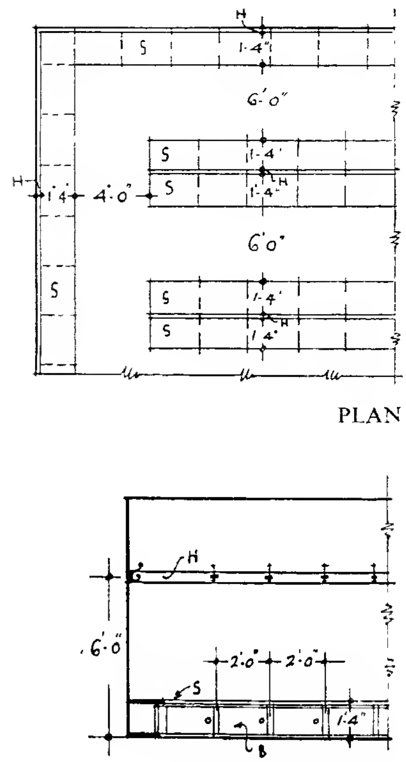
### Sanitary Accommodation

The requirements of clubs in regard to the provision of sanitary accommodation vary with the type of games to be played and also the amount of money available. Some W.C. accommodation is needed at all clubs, and where water is not available earth or chemical closets must be installed. The number of fittings to be provided should be based on two W.C.s and 8ft. run (or four stalls) of urinal space for the first 25 men, with an addition of one W.C. and two urinals for each additional 25 men. W.C.s for women should be provided on the basis of one for every ten persons. In large clubs used by a number of teams it is usual to group all the W.C.s and urinals together, rather than attach a part of the total provision to each changing room or lavatory.

### Lavatories

Lavatory basins are sometimes provided in the changing rooms themselves, and sometimes in separate lavatories. If lavatory basins are placed in changing rooms, some economy of space may usually be achieved, but services are then apt to be more costly owing to the increased lengths of pipe runs and drainage.

The great drawback to basins in changing rooms is the risk of water, dirt and dampness being splashed and trodden in rooms where shoes and boots are left about, and where clothing may be hanging. Basins in changing rooms of clubs for use in connection with games such as tennis, bowls, and cricket, which are mainly free from mud and dirt, are less harmful than where



PLAN

SECTION

KEY
H—hat and coat rail and hooks
S—seat
B—boot lockers or racks

Fig. 6 Changing room

games involving mud are concerned. Full details as to average sizes and much general information are given in Part 1: Sanitation.

Direct access from changing rooms to lavatories is advantageous, but when there is a number of changing rooms using one lavatory it is better not to have direct approach. If corridors are used for circulation between changing rooms and lavatories great care must be taken that there is an adequate cut-off from draughts and from club rooms on corridors used by the opposite sex or by non-member visitors; corridors are frequently used by players only half-dressed.

### Bathrooms

Bathrooms present a more difficult problem; a bath is more or less essential after some games, and in many clubs of the more expensive type the

players desire bath facilities after all games. (*See* Part 1: Sanitation.)

### Locker Rooms

Locker rooms are not often provided in clubs, except where games such as squash rackets, tennis and golf are played; golf clubs are discussed later in this section. Individual lockers should be at least 12in. by 12in. on plan, and are usually 6ft. in height, unless double rows are introduced, when the height is reduced to about 3ft. Lockers and their spacing are referred to in other sections. If seats for changing are not required, changing room space having already been provided, the gangway widths between rows of lockers may be reduced to 3ft. Lockers, as in other types of buildings, may be of wood or metal, although the latter is much to be preferred.

### Club Room

This room has to serve for many purposes in most of the types of pavilion already mentioned, although its main purpose is generally for the service of meals. Except in small pavilions, when it cannot be avoided, the club room should not be used for general circulation between other rooms. The room should be rectangular in shape, with one of the long sides towards the playing area; this long wall should have as much glass area as possible, which should be capable of opening in the form of doors if the pavilion is to be used for summer games. Fixed furniture or fittings are not usually required. If the pavilion is to be used during the winter, some form of heating is essential and an open fire seems to be much appreciated; when open fires are provided, they should preferably be placed on the long wall opposite the windows. The entrance from the kitchen or servery to the club room should be placed as centrally in the room as possible to reduce the time of service. Some clubs use the main room during the evenings for occasional purposes, such as bridge, club meetings, table tennis, badminton and dances; if the room is to be used for badminton the minimum dimensions are 60ft. long, 26ft. wide and 25ft. high, while slightly greater length and width are desirable. Table tennis sizes are given in Part 1: Recreation.

When pavilions are planned on two floors, and the club room has a large floor area, it is often an advantage to have the room the full height of the two floors and in such a plan the circulation to upper floor rooms may be by means of a gallery or balcony open to the club room and lighted from its windows.

The area required for club rooms has either to be based on the minimum sizes needed for certain indoor games or, as is more usual, on providing seating and table space for a minimum number of persons requiring a meal at any one time; if the latter basis is to be used, allowance must be made for a certain number of friends, supporters and non-playing persons such as umpires, scorers, touch judges and committee. A floor area of at least 8sq. ft. per person should be allowed as a minimum when long tables are used and this figure should be increased considerably if small tables to seat, say, four persons are adopted; these areas allow for gangway or service space where accommodation is for 30 persons or more. Clubs to be used in summer time only for games such as tennis must calculate for meals being served over a longer period than in the case of winter games—for instance, a football match—when 30 persons and their guests require service simultaneously; in summer time the surrounding ground and open verandas may also be used for meals.

### Kitchen

The requirements of kitchens vary very much. In some pavilions tea only has to be served, whereas in others full meals—generally luncheons—have to be provided. Many clubs, however, rely on the main part of the cooking being done elsewhere, and provision is therefore necessary only for heating certain dishes, such as vegetables, and for supplying tea and coffee. The important provision that is really essential is to have sufficient space in the form of shelves or tables on which the large number of meals may be put ready for very rapid service to the club room. The equipment needed is usually very simple, and consists of urns or stoves for water and coffee heating, sinks and draining-boards and ample storage for china and glass. Larder space is not, as a rule, required on a very generous scale, since little food has to be kept from day to day.

### Verandas

Covered verandas and open or covered balconies should be at least 7ft. wide in order to provide gangway space in addition to the area needed for chairs; it should be noted that the latter are often deck chairs. It is preferable if the ends of verandas and balconies are closed as a protection against the wind.

The effect of the roof cutting off light from club rooms placed behind them should be remembered and, if height in the club room permits, clerestory lighting should be provided.

Verandas should be raised well above the ground, partly for dryness and partly so that persons seated on the veranda may see over the heads of persons standing between the building and the playing pitch. Balcony provision is often made in cricket pavilions for the scorers, who must have a clear view of the playing pitch and be visible to the umpires. The score board is usually placed close to the scorers and raised high above the ground, so that all spectators may see it; the size of the score board varies very much, according to the size of the ground and the importance of the club, and consequently no useful dimensions can be given in this section.

### Store Room

It is most important that a room of adequate size be provided for storage of equipment, especially in those pavilions which are used for different games in the summer and winter, and in which the main club room is in continual use and therefore not available for storage purposes. Tennis boundary nets, cricket practice nets, football and hockey goals all require not only ample floor space, but also considerable height and many pavilions do not provide nearly sufficient space for the purpose. External access is desirable to store rooms, but if they are to be used for housing machines such as motor mowers, care should be taken to provide easy access and doors of adequate width.

### Golf Club Buildings

Golf club houses are somewhat different from pavilions for other games, since they are in more constant use all day and all the year round than other pavilions; also more facilities for members, such as dining-rooms, games rooms, club rooms and bars have to be provided. Accommodation for players of both sexes is generally needed, besides certain rooms for non-members connected with the club, such as the professionals, caddies and club secretary.

It should also be remembered that the golf club may, in many instances, tend to merge into the country club, with bedroom accommodation for members and guests, although in the present section this residential type is not included.

The club rooms are generally grouped together for purposes of refreshment service; locker rooms for each sex form separate groups, together with changing rooms, lavatories and drying rooms. The dining-room must be grouped with the necessary kitchen, stores and staff rooms. The rooms for the professional and caddies are sometimes attached, and form a wing of the main club house but in other schemes are detached. A special room is often provided for committee purposes and adjoining this a secretary's room is usually placed.

In addition to the direct approach to the main entrance of the club and its public rooms, access is usually needed directly from the course to the locker rooms, so that players may take their clubs to their lockers and change their shoes before entering the general rooms. Many clubs set aside special rooms for the use of men or women members only and these must be planned for easy communication with the locker rooms of the same sex. Fig. 7 illustrates an analysis of the general plan circulations of a golf club house, showing the relationship of the various rooms.

The general rooms do not call for very much special comment, as the detail and size of such rooms depend largely on the anticipated number of members; the space to be allowed per person in the respective rooms is discussed in Part 1. The positions having the best aspect and views of the course should be given to main lounges and dining-rooms; these rooms should be rectangular in shape, and have windows on one at least of the larger sides. Locker rooms and service rooms may be placed in positions with less good aspect and views. The area occupied by locker rooms is generally large in proportion to other rooms.

Most golf club houses are one-story buildings unless they have bedrooms or a steward's flat placed on one or more upper floors. In some clubs the rooms for lady members are placed on an upper floor. Bedrooms, when provided, are planned on similar lines to an hotel, but there is generally a greater demand for single rooms than double rooms. Bedrooms may be on the small side as far as floor areas are concerned, since they are generally not occupied by the same person for more than a few days continuously. All sleeping accommodation should be carefully cut off from public rooms. As a rule, no separate public rooms—such as lounges or dining-rooms—are provided for resident members.

Much of the planning of the public rooms is dependent on proper grouping to provide bar and light refreshment service to a number of rooms. Lounges, bars and billiard rooms should, as far as possible, be planned round one central bar or service space for convenience in staffing.

Similarly, rooms requiring kitchen service, such as lounges, tea terraces and dining-rooms, should be placed near one another.

### Lavatories, etc.

Lavatories, cloakrooms, and W.C.s should be grouped for each sex, and should be placed near any public rooms set aside for the exclusive use of one sex. It is undesirable that locker rooms should open directly off any public room except a main entrance hall.

Lockers are needed in most club houses for a large proportion of the total number of club members, since they are used for the storage of golf bags and clubs, playing clothes and shoes, together with spare balls and other small accessories, all of which members may wish to leave at the club between games. Some clubs provide small lockers about 9in. by 9in. and 4ft. high, in two tiers, but others find that lockers about 12in. by 12in., and 6ft. high, in single tiers, are more desirable. Some clubs provide even larger lockers for part or the whole of the membership. Lockers should have at least one shelf, and preferably two, one near the bottom, to separate clubs and clothes from shoes, and the other for hats, golf balls and other small objects.

In addition to the lockers, seating and hanging space for clothes is required for the use of members changing and while playing. The lockers are usually used for storage, only coats and other clothes being left on the clothes stands while playing. Fig. 8 illustrates typical spacing for a golf club locker room, together with a typical section. The centre fitting comprises a double-sided seat with a centre rack for clothes hooks or pegs. These fittings will only provide a proportion of the locker numbers in the room, since all members having lockers are unlikely to be playing at any one time. Gangway spaces of at least 4ft. are necessary between the seat fronts of the central fittings and the lockers to allow adequate changing room space. Windows in locker rooms should be placed 3ft. 6in. or 4ft. above the floor and reach to as near the ceiling as possible. Cross ventilation is most important.

In small clubs, lavatory basins are sometimes placed in the locker rooms, but in larger clubs it is usual to have separate lavatories grouped with the W.C.s or divided from them as a separate compartment. Many clubs provide some facilities for bathing—often in the form of shower baths with small dressing-rooms attached, similar in general layout to the bath accommodation which is shown in Part 1: Sanitation.

In the lavatories it is desirable to provide a small shallow sink in which golf balls may be washed, it being undesirable that lavatory basins should be used for this purpose.

### Drying-rooms

Attached to and approached from locker rooms or lavatories should be placed a drying-room for wet clothes. Separate drying-rooms for each sex are preferable to a central drying-room. Heating coils or pipes connected to the heating system are generally used for the drying-room and are placed near the floor; in addition some ventilation for the removal of humidity is needed. The usual equipment provided consists

of heavy rods, from which clothes hangers may be suspended as well as metal tube shoe-racks.

### Professional and Caddies

Accommodation has to be provided for the professional and for the caddies; the professionals usually require two rooms—one for use as a showroom or shop and the other as a workshop, and one or two rooms are provided for the caddies. Where two rooms are provided, one serves as an office and workshop for the caddie master. Lavatory accommodation and facilities for the drying of wet clothes should also be provided for the caddies. The equipment necessary is of a simple nature in all the rooms. The showroom requires racks and shelves for the display of clubs, golf balls and other equipment. The workshop needs a sink and ample bench space with good daylight. The caddie master needs a table or other writing space, a sink, bench, and fixed seating, while the caddies need fixed seating, generally placed round the walls. Fig. 9 illustrates an analysis of the necessary accommodation for the professional and caddies.

### Car Parking

Many clubs do not pay enough attention to the provision of sufficient car parking space properly arranged for the easy entrance and departure of vehicles. In many clubs a very large proportion of the members arrive at the club in cars, and when proper spaces are not provided, acute congestion often occurs. Some covered garage space for use of the staff is often required. Full information regarding the parking of cars is given in Part 1: Transport.

### Layout

Care should be taken to plan properly the ground surrounding a golf club house—for instance, as a garden incorporating terraces and lawns. The terraces and lawns are useful in summer as an extension of the lounge and even the dining-room. Such layout should lead by transitional and suitable design to the first tee of the golf course.

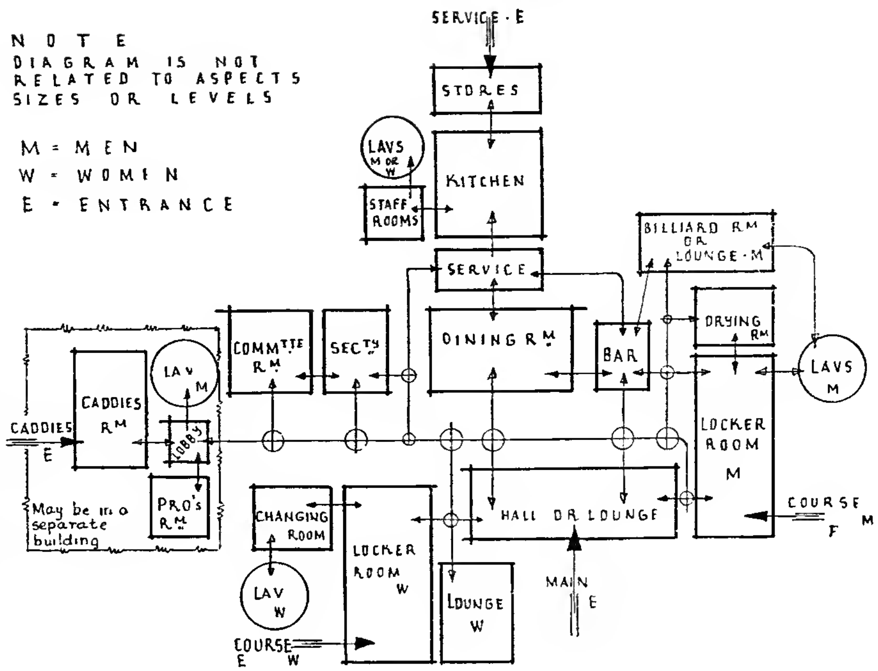



Fig. 7 Plan analysis

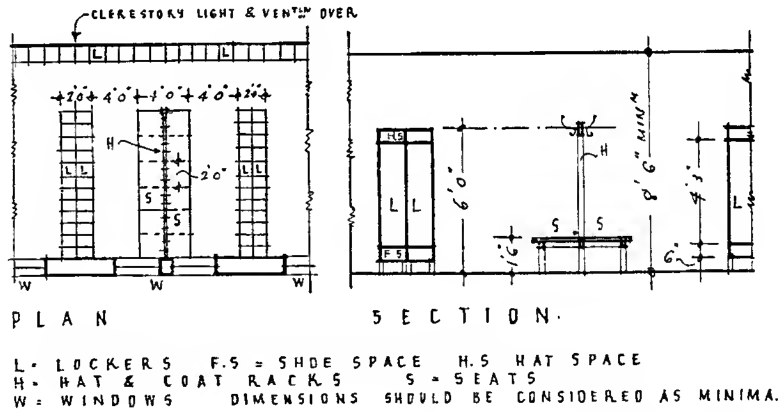



Fig. 8 Locker rooms

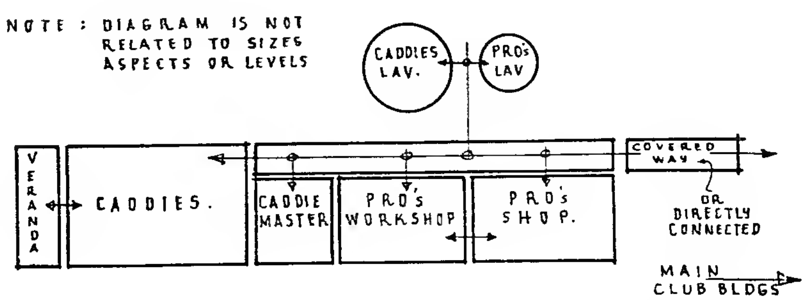



Fig. 9 Professionals' and caddies' accommodation

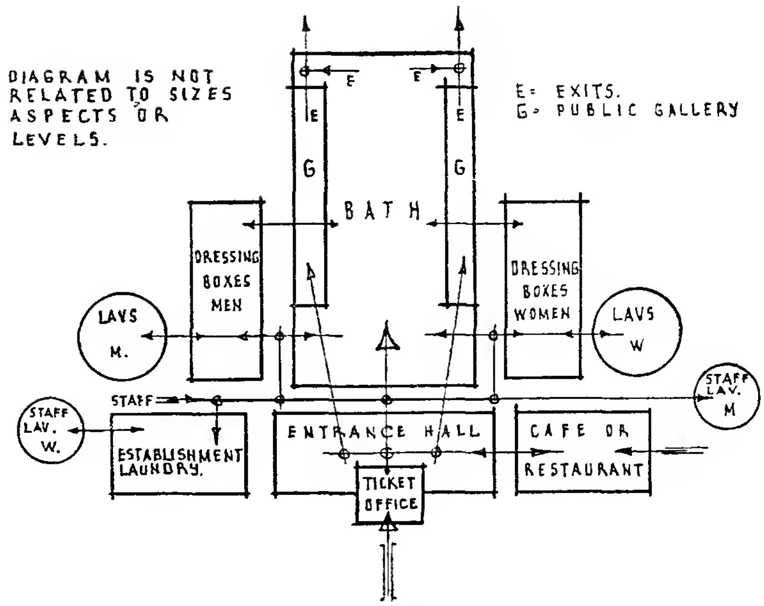



Fig. 1 Analysis of single-bath type

### Introduction

This section concerns the planning of indoor or covered swimming baths, the various types of special baths often planned in conjunction with bath schemes such as slipper, Russian and Turkish baths and, in addition, the requirements of public wash-houses: it is supplemented by a section on open-air swimming baths. Many of the planning requirements and details of equipment of covered baths are similar to those necessary for open-air baths, but varied to suit somewhat different conditions.

There has been very great development in the planning and equipment of covered and open-air baths during the last few years, and recent examples are vastly different from the bath schemes built during the latter part of the last century and during the early years of this one. The majority of covered baths open to the general public are municipally owned and operated, while the remainder are controlled by schools, hospitals, clubs and similar private institutions.

The Baths and Wash-houses Act, 1846, gave municipal authorities the right to build and maintain buildings of this type for public use. The Public Health Act, 1936, in section 233 gives local authorities the right to make by-laws controlling various matters concerning the conduct of swimming baths, whether open or covered, which are not under their own management (privately owned or operated); these by-laws are in respect of purity of water, adequacy and cleanliness of accommodation, conduct of users and prevention of accidents. This section of the Public Health Act does not apply to municipally managed baths.

### Alternative Uses of Covered Baths

In the past, most covered baths had to be designed for alternative uses in the winter months; many municipal baths are converted into public halls for such purposes as concerts, plays, dancing and public meetings. The Ministry of Health now recommends that covered baths should be kept open in winter months. There is no doubt that it is almost impossible to design a building which will serve properly two such contrasting purposes as a swimming bath and a concert hall, and consequently when both uses are demanded one or other of the purposes must be badly served. The shape of a swimming bath hall is not the most suitable for a concert hall, nor can the acoustics or decorations be suitable for both uses. Swimming pools call for hard impervious materials which make good acoustics impossible for concerts or public speaking.

The only alternative use which seems in any way reasonable is to use the bath hall for a covered playground for games and indoor sports such as badminton, tennis, or boxing.

When the bath hall is to be used for public entertainments or meetings many complications arise as the result of compliance with means of escape and similar regulations enforced by the licensing authority.

### Sites

Covered swimming baths, except those attached to private and public institutions, are usually built in urban areas with fairly dense populations. As a rule their cost cannot be justified except where there are concentrations of population. The site need not be chosen in a position where land values are very high, as for instance in main streets, unless it is decided that the building is to be used also as a public hall. It is desirable that there should be good transport services in the vicinity giving rapid access to all parts of the town in which prospective users live. The site must be of adequate dimensions to take care of all possible future developments that may be necessary. It has frequently been pointed out that sites of inadequate size have been selected, resulting in costly construction and inefficient planning.

The site should have sufficient area to permit of car-parking and a draw-in for goods deliveries. If the building is to be used for public entertainments, space for alternative exits and the handling and parking of private cars and other vehicles should be carefully considered.

A secondary road approach is very helpful for service deliveries. When public wash-houses are incorporated with baths a suitable position for an approach away from the public baths entrance is most desirable, either at the side or rear of the building.

### General Layout

The report of the special committee appointed by the R.I.B.A. in 1934 to consider the cost of public baths and wash-houses stresses very strongly the importance of good planning as the main factor in economy of cost. This report emphasizes that indirect planning

is expensive, not only in structure but on account of complications of services, while bad planning means costly construction and increased maintenance.

The building may require one swimming bath only, together with the necessary dressing accommodation and engineering services. Equally it may comprise two, three or more baths, for first- and second-class bathers and beginners, slipper baths for two classes of each sex, special baths for each sex and public wash-houses together with greatly increased service accommodation, including the establishment laundry.

Fig. 1 illustrates diagrammatically the analysis of a covered bath scheme having only one swimming bath and no other types of baths or wash-houses. The figure shows clearly the important relationships between each of the parts. At the main or public entrance is placed the ticket office and towel store, from which bathers pass according to their sex to the dressing-boxes placed adjoining the bath. The swimming bath itself should only be accessible by passing through the dressing-rooms and any cleansing accommodation provided. If a spectators' space is needed, this should be accessible only from the main entrance hall wherever it is situated. Thus spectators and bathers are always segregated, which assists control and cleanliness of the establishment. Secondary exits are usually needed for the spectators' seating whether this is near the water level or in a gallery. Lavatories must be attached to the dressing accommodation of each sex for use of the bathers. Some staff rooms are essential for the use of the instructors and controlling staff, and also for the establishment laundry and engineering staffs. The establishment laundry, when possible, should be planned so that used costumes and towels may be rapidly passed from the dressing accommodation to the laundry and the clean towels, etc., easily returned to the issuing office. A café or restaurant serving light refreshments is often provided.

Fig. 2 illustrates the general analysis of a large scheme having two swimming baths, slipper baths for two classes of each sex, a special bath unit providing for Turkish and similar baths for both sexes, a café and a public wash-house unit; the last, although often planned with the second-class accommodation, should be a unit separated from the remainder of the scheme excepting in regard to services, staff and administration. It should be noted that one main entrance is used to control the whole building except the wash-house unit, in order to reduce the controlling staff to a minimum; however, examples may be found where the approaches to each class are separate and even subdivided again into sexes, although the tendency is now towards a unified approach, especially as mixed bathing is now generally permitted in public bath establishments.

### Entrances

As previously stated, it is desirable for the entrance hall to serve all parts of the building, however large it may be, excepting the public wash-house. It should be of ample area depending on the size of the building and it must be borne in mind that there may be large numbers of people requiring access to the building in a short space of time. The central element of the entrance hall is the ticket office together with towel and costume distributing office when these are combined; the two offices are sometimes separated in large establishments. In extensive schemes considerable space for the combined ticket office and towel distribution is required, with several issuing windows to reduce congestion. The administrative offices, and particularly the superintendent's office, should be approached easily from the entrance hall, although it may often be found economical to plan these on an upper level. The towel and costume store may sometimes be planned adjoining and at the same level as the issuing office, but in many schemes it has been found to be more economical to place the storage at a basement level with a small hand-lift connecting to the issuing office. It is generally found difficult to plan the laundry in close proximity to the towel store and issuing office, although this is most desirable when in any way possible. Some large bath schemes have the towel issuing offices adjoining part of the dressing accommodation, so that they are in the charge of the same attendants, especially when a similar type of locker or clothes storage system is employed, with dressing-boxes only in use during the actual period of changing clothes, and not for clothes storage during the period of bathing.

When the building is to be used for alternative purposes in winter time, the entrance hall must be planned in such a manner that it is suitable both in size and shape for the control of crowds, as at the commencement and end of concerts or public meetings. When such uses are contemplated, cloakroom facilities must be given consideration and specially planned for; such facilities are unnecessary when the building is to be used only for bathing purposes. The ticket offices and towel-issuing offices may also need special consideration for adaptation to the varied conditions. Some schemes have even had a separate entrance hall planned for use when the building is a public hall, with direct access to the main area of the bath hall, which is avoided if the building is used for its normal purposes when bathers should pass in the first place to the dressing accommodation.

The entrance hall should be designed to act as a cut-off for cold air and draughts entering both the dressing accommodation and the bath hall, if there is not an entrance vestibule. The finishes of the entrance hall should be selected for hard-wearing qualities, but they need not be impervious materials as in the damper parts of the building.

The pay-box itself should occupy a prominent position and one which is obvious from the entrance doors. It is customary to enclose the pay-box with glass above counter height, which is generally about 3ft. 3in. above floor level; this enclosure need not be carried up for more than a height of 7ft. or 7ft. 6in. above the floor and should have the necessary holes for the tickets, speaking and towel issue. Provision is usually made in the counter for ticket-issuing machines, coin-change machines or cash registers, but even with these provisions a cash drawer is desirable in addition. The pay-box may be of minimum dimensions to accommodate one or more cashiers as required, if not used for towel distribution, but if used for the dual purposes much shelf space is required. The amount of shelf space needed depends entirely on the proximity of the storage space and method of delivery of supplies from storage to issuing counters. Shelves should be from 15in. to 18in. deep and spaced at

approximately similar heights above one another; the lowest shelf should be at least 6in. clear of the floor. Fig. 3 illustrates in diagrammatic form the entrance arrangement of a large swimming bath scheme having two swimming baths, slipper baths and special baths. There is a large rectangular entrance hall with a large pay-box and towel issuing office combined immediately opposite the entrance doors. Behind the pay-box is a towel and costume store with direct intercommunication. The towel store is fed from a lift in a service corridor in the basement where the establishment laundry is also situated. At each side of the pay-box are the approaches to the first- and second-class baths; these approaches are shared by both sexes, who afterwards divide to reach their respective dressing accommodation.

At each end of the entrance hall are placed staircases, at one end leading to the slipper baths, which are situated on the floor level above the entrance, and at the other end leading to the offices and spectators' gallery overlooking the first-class bath. Spectators' accommodation is not usually provided in the second-class bath.

On the ground floor at one end of the hall is the café or refreshment room, so placed that it is accessible to all types of visitors to the building without their entering the specialized groups of accommodation. At the opposite end of the entrance hall are the special baths which are placed on the lower level in order to be as near the heating plant as convenient to reduce the necessary services to a minimum. This general entrance hall layout allows a fairly free circulation in which congestion and cross circulation are reduced almost to the minimum. Fig. 4 illustrates diagrammatically another large bath scheme, and is similar in many respects to Fig. 3, excepting that the pay-box is somewhat differently placed, while the towel-issuing takes place at the approach to the dressing accommodation instead of at the pay-box. By placing the pay-box at the entrance to the building the amount of cross circulation in the entrance hall is reduced, and the hall itself is more free as a waiting and circulating space, as well as permitting the whole of the long wall of the hall opposite the entrance to be used for the approach doors and corridors to the other parts of the building, which in

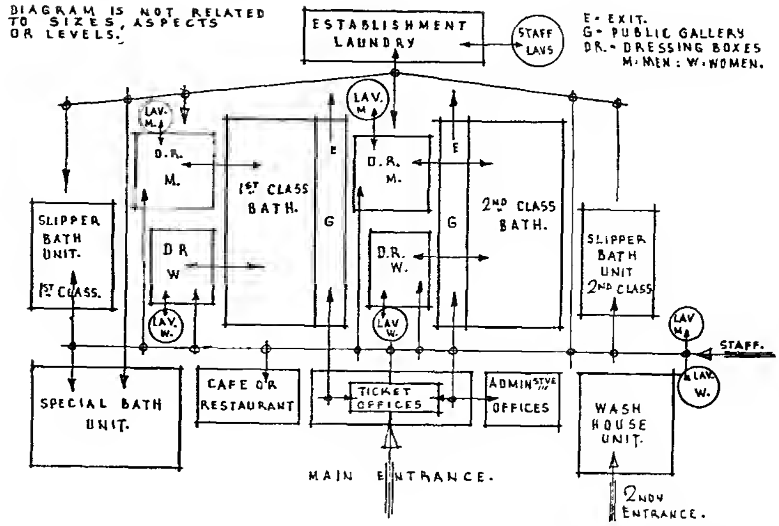
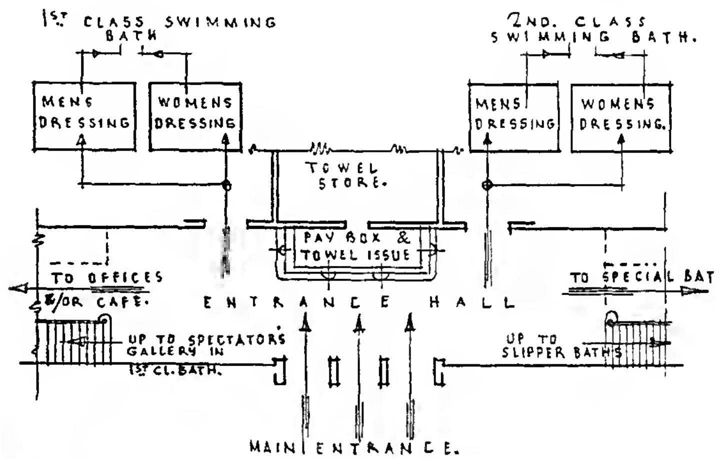
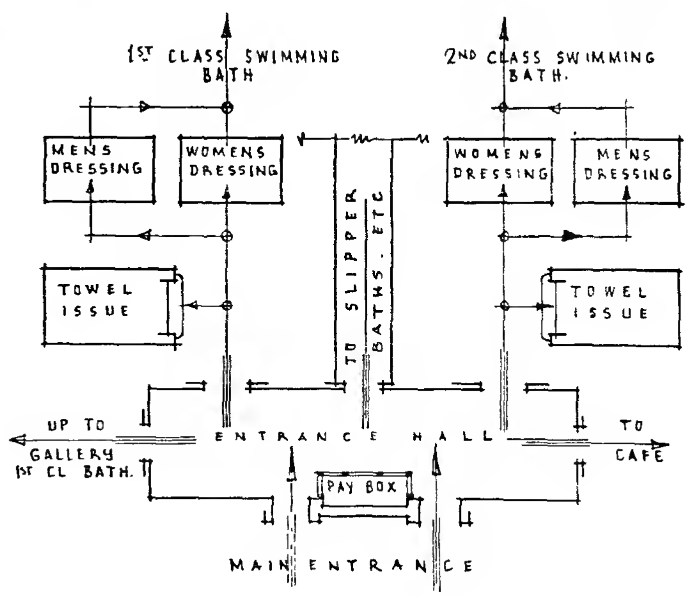



Fig. 2 General analysis diagram




Above: Fig. 3 Main entrance

Below: Fig. 4 Alternative main entrance



this example is mainly of a single-storey type.

Fig. 5, Diagram A, shows a smaller type of scheme having one bath only and some slipper and special baths. The combined pay-box and towel issuing office are central, placed in the entrance hall opposite the entrance doors. The towel issuing office is connected to a basement towel store by means of a small hand-operated lift about 2ft. by 18in.

At one end of the hall is the approach to the slipper baths; at the opposite end are placed the café and the superintendent's office.

In some schemes, especially when the entrance to the building is on the long axis of the entrance hall, the café is placed in the hall itself, so that the entrance hall becomes a general concourse or meeting place for the whole building.

Fig. 5, Diagram B, illustrates an example of this type which is a large scheme with two classes of bath. An entrance hall of this character will generally occupy a fairly large area, but it permits better and more direct circulation to all sections of the building, more especially as the two units may be placed on each side of the hall, as for instance, the first-class swimming pool on one side and the second-class pool on the other. The slipper baths are placed over the special baths.

### Bath Hall

With the general acceptance of mixed bathing there is little need to provide separate baths for each sex, and even when segregation is specially desired, special times may be set aside for the one bath to be used by one sex only. Also, the provision of baths of two classes is considered by some to be of doubtful value, as one or other is likely to be used to a lesser extent.

It seems preferable to provide a special bath for children and non-swimmers and even, in addition, a bath for the sole purpose of diving rather than baths for different classes. A shallow bath for children, preferably in a separate hall, has an advantage in that teaching does not interfere with the general use of the main bath. An alternative scheme, which seems to offer certain advantages, is to provide a separate bath for diving and use the ordinary bath for all normal swimming.

### Bath Sizes

The Amateur Swimming Association require a minimum length of 75ft. for championship racing, but they recommend a minimum size for a main swimming bath of 100ft. long and 42ft. wide; these dimensions must be of the water area of the bath itself, and must be exclusive of nosings, which should not project over the water area. It is desirable that the length of the bath should be a proportion of a mile. When one bath is to be provided instead of two of different classes, a large water area is worth careful consideration, using lengths of 120ft., 132ft. or 165ft., and width of 48ft. or 60ft. A width of 42ft. to 48ft. permits eight competitors to start a race together, and 60ft. allows for ten persons. The lanes are generally based on the provisions of 5ft. 6in. to 6ft. per swimmer in width. The lanes are usually marked on the bottom of the bath by coloured lines inlaid in the finishing material, but some swimmers favour the provision of cords supported by corks stretched along the surface of the water.

There are, however, certain factors which should be borne in mind in regard to water areas, which influence economy. In small towns, private communities and lesser bath schemes in large towns, a length of 75ft. will suffice for normal use, and, where galas are likely to be held, as in the principal baths of large towns, 100ft. is an economical length. The increase in width of the water area causes an increase in span which is usually much more costly than an increase in length, so that a width kept to 35ft. assists greatly the cost of any scheme, and often in small schemes it may be justifiable to reduce this dimension to as little as 30ft., which can be used for six lanes, although the total space then becomes a little cramped.

### Depth of Water

The depth needed for children and non-swimmers varies from 3ft. to 3ft. 6in., and many schemes provide at least 3ft. 3in. 4ft. depth is the absolute minimum desirable for any water area to be used for water polo and it is preferable if the whole polo area has a depth of at least 6ft. The length of the water area for water polo is not less than 19yds. nor more than 30yds., with a width not greater than 20yds.

Fig. 7 illustrates the essential information necessary for a water-polo playing area. The width is usually dictated by the full width of the bath, and the maximum of 60ft. is seldom likely to be obtainable in indoor or covered swimming baths. Generally, in order to provide the maximum depth of water, the playing area is kept to the deep end of the bath—a factor which should be remembered when arranging the seating needed for spectators on each side of the pool.

For normal purposes of swimming and diving a depth of 9ft. is essential over part of the water area, but, unless high-diving stages are to be installed (often this cost is unjustifiable), a maximum depth of 7ft. is sufficient, which is economical in excavation or where bad foundations are likely to be encountered.

When baths are to be used for diving championships the water depths must be increased greatly according to the height of the stages, which may vary up to 10 metres. The sections needed for baths where such stages are to be used are detailed in the section on "Open-air Swimming Baths"; the dimensions given should generally be considered as minima.

Fig. 6 illustrates three typical plans of different types of bath halls. Diagram A shows a single bath 100ft. long by 42ft.; the surrounding walking ways, exclusive of any areas used by spectators or for access to dressing-boxes, not used after planning spaces for cleansing showers or troughs, should be at least 6ft. on the long sides and at the shallow end, and at least 12ft. at the deep end where diving-stages or boards are placed.

Diagram B shows a scheme having three baths in one large hall for swimming, diving and non-swimmers respectively. Six-feet widths are provided round the main bath, with 12ft. at each end of the diving-bath. One bath only then needs to have a greater depth than 8ft. 6in. or 9ft. It should be noted, however, in a scheme of this type that the roof span is very large and the scheme may consequently be uneconomic on that ground, but, from the point of view of the users, the "three-bath" arrangement is probably ideal, especially for family use when the parents and older children may be in the same space as the younger and non-swimming members of the family.

The scheme shown on Diagram C of Fig. 6 has the advantages of separating the diving from the swimming and, at the same time, has a much more economical roof span than scheme B. The division between the two baths may be either temporary or permanent and if the former, the full length of the combined water areas is available for racing. The length of the water area of the diving-bath is dependent on the height selected for the highest staging and may need to be at least 30ft. This scheme also provides a minimum surround of a width of 6ft., increased to 12ft. at the diving end.

Some covered bath halls, in recent years, have been planned with a large glass area on one long side of the bath either as a window or as movable screens opening on to gardens or paving; if a plan of this type can be adopted by the nature and position of the site it adds greatly to the attraction of the bath, especially in warm weather when a normal top-lit covered bath hall becomes very humid. Seating for spectators in a scheme of this type will need to be placed on one side only, but some additional temporary seating can be placed adjoining the window wall. The opening windows or wall give bathers access to terraces and/or lawns where they may sunbathe or take part in physical exercises. Advantageous also is the amount of direct sunlight which penetrates the bath hall in a more efficient and pleasant manner than is possible with any form of roof lighting; in addition, the atmosphere and general appearance is more comfortable. The large glass area of a long wall naturally involves more heating in cold weather. There are several methods of treatment of the window wall, the best but most costly of which is to arrange the lower portion so that it may be lowered to below ground level, or, alternatively, lifted in sections on the principle of a sash window or by sliding sections sideways. Such a scheme allows the bath hall on occasions to be semi-open air: the alternative is to have a number of glazed doors formed in the window.

The majority of bath halls are top-lighted and ventilated from the roof with some side lighting from windows placed high in the walls in addition. Excessive height is to be avoided on the grounds of economy of construction, and a height equal to about half the shortest dimension of the hall is often found to be adequate.

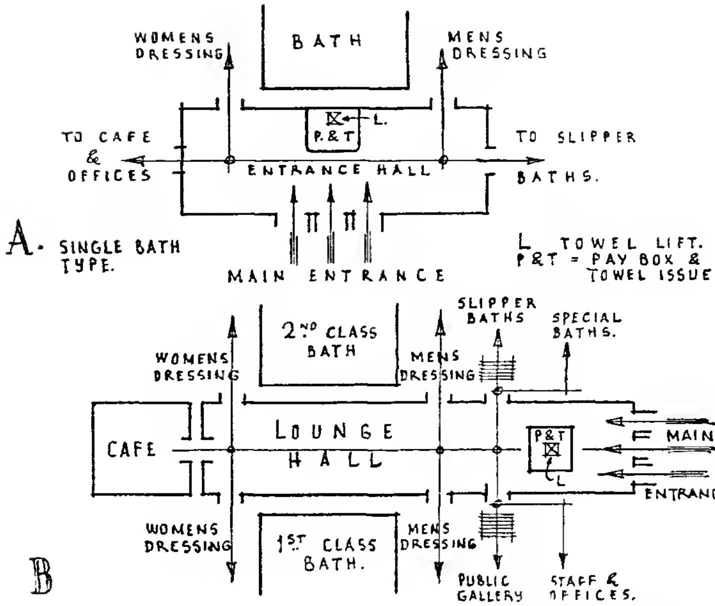



Fig. 5 Main entrance

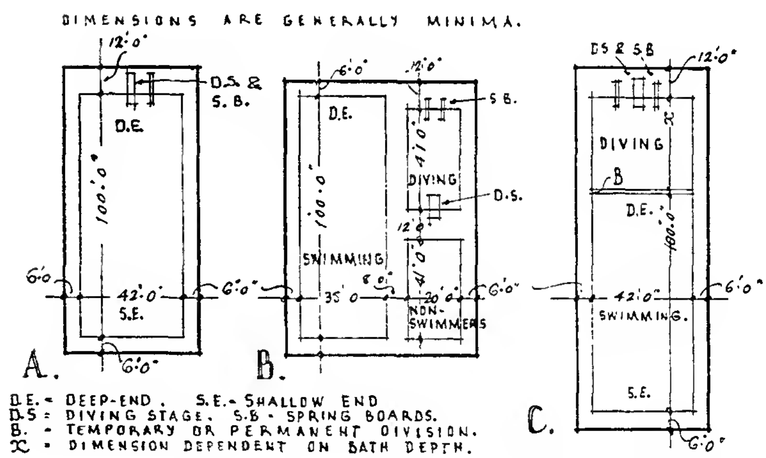



Fig. 6 Swimming bath sizes

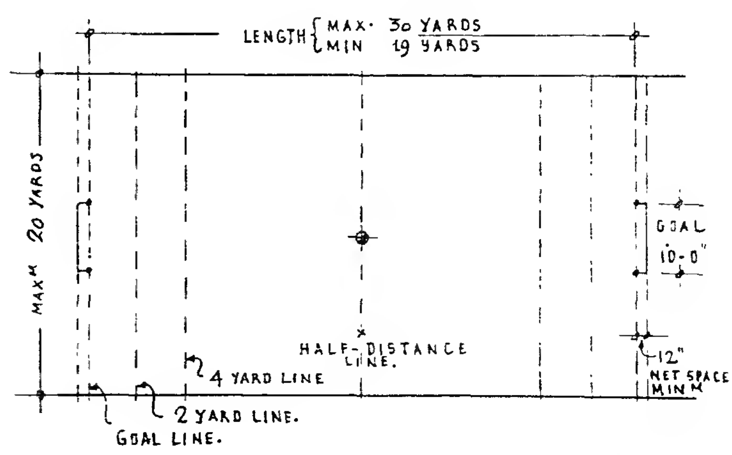



Fig. 7 Water-polo playing area

Fig. 8 illustrates a bath plan of the side-lighted type having one wall mainly of glass through which access to the garden is available. It should be noted that a wide bath surround is placed on the window side of the bath. It is important that foot-cleansing troughs should be planned between the terrace or lawns and the pool where bathers re-enter the building, and at the same time barriers or other means of control must be so arranged that bathers must pass through these foot-cleansing troughs to avoid carrying dirt into the water.

### Spectators' Seating

Most baths provide some seating accommodation for spectators and in those which are to be used for competitions, water-polo matches and displays, ample seating is essential. The approach to this seating should be entirely separate from the bathers' circulations and the surrounds to the bath. The angle of vision for seated spectators is a most important consideration and a clear and unobstructed view of the whole water area should be provided. In schemes of lesser importance and in private baths which are used very occasionally for competitions special seating for spectators is not provided, but the bath surrounds are increased in width to about 7ft. which allows for two rows of temporary seats to be put in without cramping the bath surround unduly for bathers. Such a scheme of seating is to be avoided in baths frequently used for displays because of the dirt brought into the bath hall on spectators' shoes.

Galleries or seating are usually placed on the two long sides of the bath as these positions provide the best views for all types of water sports, but in some buildings—to increase seating capacity—further seats are provided at the end of the bath farthest from the diving boards (shallow end) and very occasionally at the diving board (deep) end. In the latter position high diving stages obstruct the view very badly. Smaller schemes and, in particular, private baths attached to schools and institutions are planned with seating on one long side of the bath hall only.

The usual methods of providing the spectators' seating are of two general types, namely, gallery or amphitheatre; the latter type is recommended by most authorities as it provides for better vision than by the use of galleries and at the same time spectators are close to the water level. Fig. 9 shows sections of both types. Amphitheatre seating is best arranged with the lowest tier about 4ft. 6in. above the bath surround, which prevents competitors and officials standing on the surround from obstructing vision excessively. The tiers in both types are better if gradated in increasing heights towards the top to assist the view from the back rows. Galleries often provide very bad sight lines and vision of the nearest edge of the pool is often cut off, especially when galleries are not set back behind very wide surrounds to the pool. It should be noted that the amphitheatre type of seating is more costly mainly on the ground of the increase necessary in the span of the hall, but galleries increase the desirable height of the hall to a lesser extent. Fig. 9 shows the approximate increase in span necessitated by the amphitheatre type of seating in two parallel examples. The gallery type is based on an allowance of 7ft. from the surround to the underside of the gallery for dressing-boxes. The dressing-boxes may be planned below the seating in the amphitheatre type as shown on the figure. The spacing of the seating in baths where there is admission to the public is governed by regulations controlling buildings for public entertainment as regards number and placing of exits, length of rows of seats, approach staircases and corridors, etc.

The seats are generally of teak supported on teak, metal or concrete supports from the structural steppings. All upholstery should be avoided. Guard rails and other barriers are best of metal construction designed to avoid any undue obstruction of vision. The floors or steppings to the seats should be of an impervious material which can, if desired, be covered with matting or duckboards.

### Bath Hall Finishes

The actual construction and details of the pool itself are given in the section on "Open-air Swimming Baths," and generally these vary very little for covered baths. The bath hall itself should have a high dado of impervious materials such as tiles, glazed-brick or terrazzo, but this need not exceed 7ft. in height. The upper part of the walls may be of brick, concrete or similar structural materials either left natural, distempered or painted. The continual damp atmosphere should be remembered in conjunction with the selection of all materials.

### Dressing Accommodation

Opinions seem to vary considerably concerning the amount of dressing accommodation necessary for a bath having given dimensions. The amount of dressing space in covered baths does not generally need to be so great as in open-air baths with sunbathing terraces and other attractions which keep bathers on the premises for longer periods. Dressing-boxes are not as a rule provided for every bather in recent schemes. A box is used only at the actual time of changing clothes and the clothes are then deposited in a locker or stored under the control of attendants while the bather is in the water. The box can then be used for other bathers to dress or undress.

It has been suggested that one dressing-box should be provided for every 70sq. ft. of water area. This is a sufficient proportion if locker or other accommodation is provided at the rate of three or more places for each dressing-box.

### Dressing Rooms

Changing rooms for communal use are more economical than dressing-boxes as they save floor space and the cost of partitions, doors, etc. Many bath schemes provide communal dressing rooms for the use of children, members of clubs and for use at rush periods; at least one for each sex should be provided in all bath schemes. Dressing rooms and boxes should be planned to have good light and ample ventilation.

Dressing rooms should have fixed seats, preferably of teak, cantilevered from the walls rather than supported from the floor to facilitate cleaning. Locker seats are generally to be avoided in the interests of cleanliness. Coat and hat hooks should be provided above the seats spaced 12in. apart horizontally in a single row about 4ft. 6in. or 5ft. above the floor level. If island seats are introduced, these should be double-sided with a central partition of wire mesh to keep the clothes on each side apart. Gangways between seats should be at least 5ft. wide. The walls should be covered with impervious materials to at least 5ft. and preferably 7ft. or more above the floor.

### Dressing-boxes

Dressing-boxes should be either 2ft. 9in. wide by 3ft. 6in. long or 3ft. by 3ft.: the former provides the more comfortable shape. Larger dimensions than given above are to be preferred, especially if it is possible to increase the length to about 5ft. and open the doors inwards instead of into the access corridors. Partitions are usually made of teak, terrazzo, metal or metal-faced plywood, and are generally 6ft. 6in. or 7ft. high above the floor and 6in. clear of the floor for cleaning. In some schemes where boxes are arranged in rooms devoted to each sex and not visible from the bath hall itself, partitions are sometimes reduced to 5ft. in height. Doors are sometimes the full height of the divisions, but often reduced in height to 4ft. 6in. and 6in. clear of the floor. A seat should be provided about 12in. wide and 18in. above the floor; also a mirror, trinket shelves and at least two coat and hat hooks.

### Storage of Clothes

Various methods of storage of bathers' clothes have been used including wooden or metal lockers, paper bags, wire baskets and combined baskets and hangers; most of these methods are discussed in the section on " Open-air Swimming Baths." These systems depend on the presence of an attendant either walking about among the lockers or behind a counter to receive the clothes in exchange for a numbered disc which the bather carries during the time of swimming.

Diagrams of circulations in dressing-boxes and for clothes storage are given under " Open-air Swimming Baths," but, in addition, Fig. 10 shows a system based on wire baskets or combined baskets and hangers. The bather enters the dressing room from the main hall past the counter where an attendant hands out the basket and hanger, which is taken into any dressing-box available. The bather undresses, places the clothes in the basket and hands it to the attendant at the counter as he passes to the cleansing room which gives access to the bath hall. After bathing the process is reversed and the empty basket is handed to the attendant at the counter on leaving the dressing room for the main hall.

As stated in the paragraphs on general circulations, it is most important that the bath should be reached

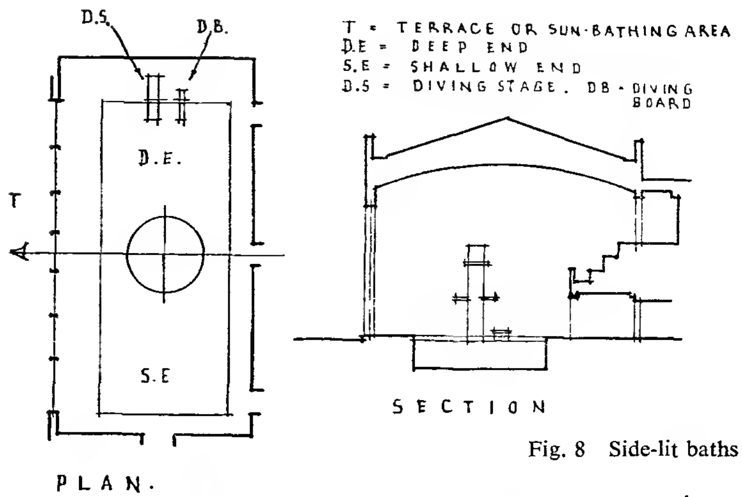
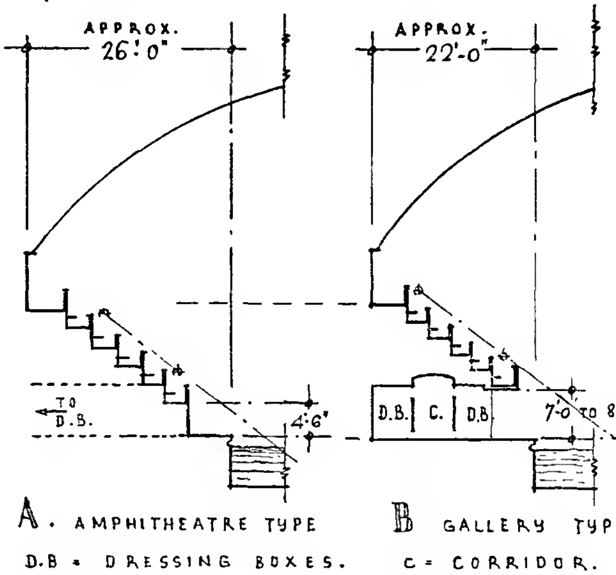
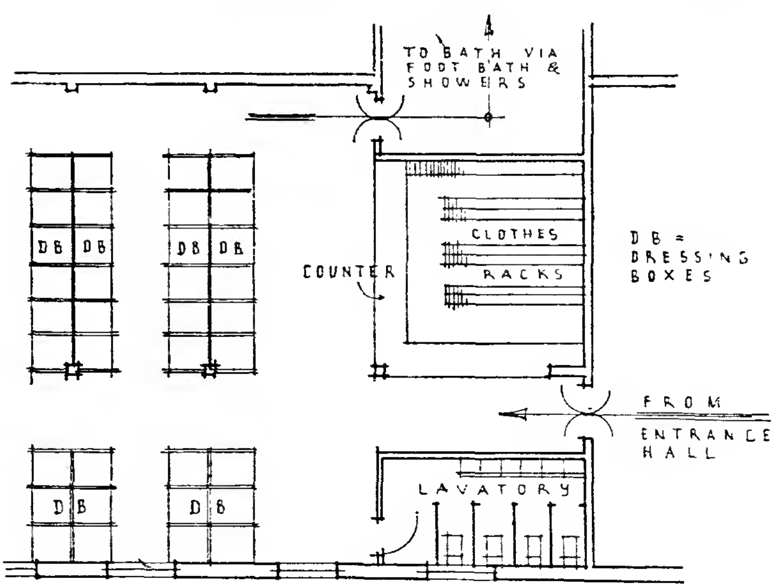



Fig. 8 Side-lit baths




Above: Fig. 9 Spectators' seating Below: Fig. 10 Cloakrooms for dressing-boxes



only by passing through the dressing room, and, if this access has to be provided from the entrance hall through the bath hall, barriers or other means must be provided to keep those who are dressed apart from those who are changed for bathing. This is in order to prevent as far as possible dirt from boots and shoes from being carried to the bath surround and also to enforce the use of bathers' cleansing rooms which are becoming a general provision. (*See* below.)

### Lavatories

Lavatories must be provided in conjunction with dressing accommodation for the use of bathers. Separate accommodation is required for spectators, who should be provided for near their seating. The minimum provision should be two W.C.s and three urinals for men and two W.C.s for women, and the numbers generally should be based on one W.C. and one urinal for the first 60 men and one additional urinal for every additional 40 men and one W.C. for every 40 women. Care should be taken that the sanitary accommodation cannot ventilate into either the dressing rooms or bath hall. For convenience of plumbing services the sanitary accommodation is often placed adjoining the cleansing room at the approach to the bath hall. This position has the advantage of obviousness, but it is often difficult to ventilate when so placed without affecting the cleansing room and therefore a position as shown on Fig. 10 is often preferred.

### Cleansing Rooms

These rooms must be so placed that it is impossible to enter the bath without passing through them. Shower baths with warm water should be provided at the rate of at least one to every 50 bathers and preferably on a much more generous scale. Liquid soap containers are usually provided. Foot baths should be planned so that bathers must walk through them to enter the bath hall, and are best arranged as large shallow pools, 8in. to 12in. deep, with constantly changing warm water.

A typical cleansing room might well include in addition some shower baths in the bath hall for use after swimming. These are generally desirable and are essential in sea-water baths. The return route of bathers from the bath to the dressing room may either be through the cleansing room or by doors or turnstiles operating in one direction only and leading immediately into the dressing rooms.

### Swimming Bath Equipment

The usual equipment needed for swimming baths, such as diving boards, is given in considerable detail in the section on "Open-air Swimming Baths." The usual apparatus provided comprises one- and three-metre spring boards and five-metre firm boards; the spring boards need a water depth of at least 9ft. and preferably 10ft., and the firm boards a minimum of 10ft. and better 12ft. depth of water. If 10 metre-high firm boards are installed the water depth should be 16ft. Exact requirements for diving stages to be used for competitions are laid down by the International Amateur Swimming Federation and these are generally adopted for most bath schemes.

### Filtration

A filtration plant is now considered essential in all schemes. There are very many systems, each of which needs different planning requirements and the spaces and areas necessary are mainly dependent on the quantity of water to be dealt with, consequently precise requirements cannot be set out in these articles. The general idea of the usual systems is summarized in the Section on "Open-air Swimming Baths."

### Slipper Baths

The need for providing slipper baths has decreased considerably in recent years due to the general provision of baths in all new houses. Most authorities agree that division into first- and second-class baths is unnecessary and it has been suggested that economy may result by providing a minimum number of baths planned in such a way that the numbers for men and women can be varied from time to time.

### Entrances

Most older schemes have separate entrances for slipper baths, and these are often subdivided into two sexes and two classes, but it is better if the main entrance to the whole bath scheme can be used whenever possible, thus obviating the necessity of providing separate entrance halls and ticket offices, which involve additional staff for this control. If two classes are provided the same waiting room may be used, as there is in fact very little difference between the two classes of baths. The sexes, however, should be separated after leaving the ticket office and main entrance hall.

### Waiting Rooms

A waiting room should be provided in association with each suite of baths; the sizes of these rooms are dependent on the number of baths in the scheme. These rooms should be well lighted, preferably by windows rather than from top lights, and good ventilation is essential. The only essential equipment is seating, which is usually provided in the form of fixed continuous seating round the walls.

### Bath Compartments

It is usual to plan the bath compartments on each side of a corridor. At one end of the corridor is placed the waiting room; leading off the bath corridor, but preferably within the actual bath unit, should be placed some sanitary accommodation providing a minimum of two W.C.s for women or one W.C. and one urinal for men, and a lavatory basin. The sanitary accommodation, if more than the minimum, should be one W.C. and one urinal for every 12 men and one W.C. for every 12 women. A small room for the attendant is necessary adjoining the corridor, placed as near the waiting room as possible, in order to control those entering the corridor, and from which he or she may issue towels and generally supervise the bath corridor. This room does not require a very large area, and 50sq. ft. to 80sq. ft. is generally sufficient, but a room is always preferable to a "box" or cupboard. The compartments are usually planned in pairs, to centralize the various services as much as possible. The compartments should be at least 6ft. 6in. by 6ft., and preferably slightly more. Baths should be at least 5ft. 6in. The divisions between the compartments should be of a hard material, such as terrazzo, tiles or glazed brick, and are usually 6ft. 9in. or 7ft. high above the floor. Wall linings should be of similar materials for the same height, with painted plaster above. Partitions, except behind fittings and doors, should be raised at least 3in. clear of the floor, to facilitate cleaning, and floors laid to fall to a channel so that the whole may be sprayed with a hose. The plumbing and services

should be arranged so as to be controllable by the attendant from the corridor side of the corridor partitions. For details, *see* Part 1: Sanitation.

Fig. 11 illustrates a typical slipper bath unit. The approach from the main entrance hall leads into the waiting room, which has fixed seating round the walls. Adjoining the waiting room, but also having a door to the bath corridor, is the attendant's room. The lavatory is planned opposite the attendant's room, but, at the same time, it adjoins the waiting-room.

### Shower Baths

It has been suggested by some authorities that shower baths might be provided instead of slipper baths, as they are more economical in space and in the quantity of hot water used. Generally, however, shower baths are not very popular and the public seems to prefer the normal tub type of bath.

In some schemes which do not have a unit for special types of baths, provision is made in the slipper baths section to provide for foam baths and occasionally for massage. Foam baths may be dealt with in compartments similar to those needed for slipper baths. Massage needs slightly larger cubicles for access on all sides of the massage pedestals and in conjunction with massage, rest couches must be provided, either in cubicles or in a separate waiting room.

### Special Baths

Many public bath schemes provide certain types of special baths. In recent years, however, the demand for such equipment would appear to be less than in the past. The most usual of these provisions are Turkish, Russian, vapour and foam, and of these the first is that most frequently required. Vapour baths are very seldom needed. The equipment of all these types of baths is rather elaborate and costly; unless there is a considerable demand they are uneconomical as an investment of public money.

### Placing of Special Baths

In all schemes the special baths should, if possible, be approached from the main entrance of the whole bath establishment and should be served by the main ticket office, so that the control of the whole building is maintained at one central point. It is desirable that the special baths, since

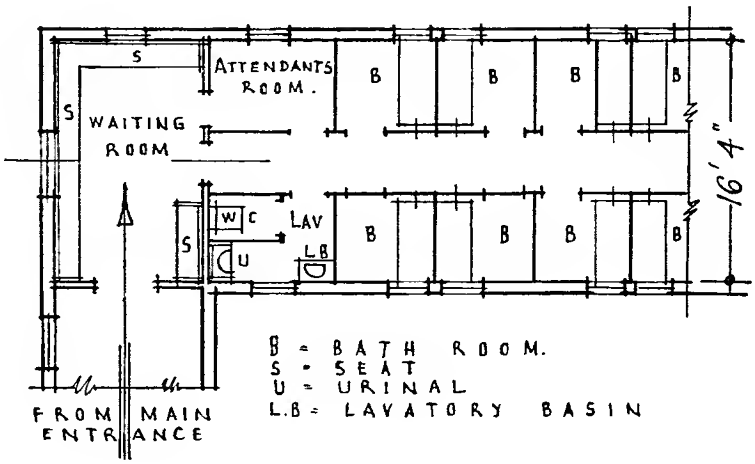



Fig. 11 Slipper bath unit

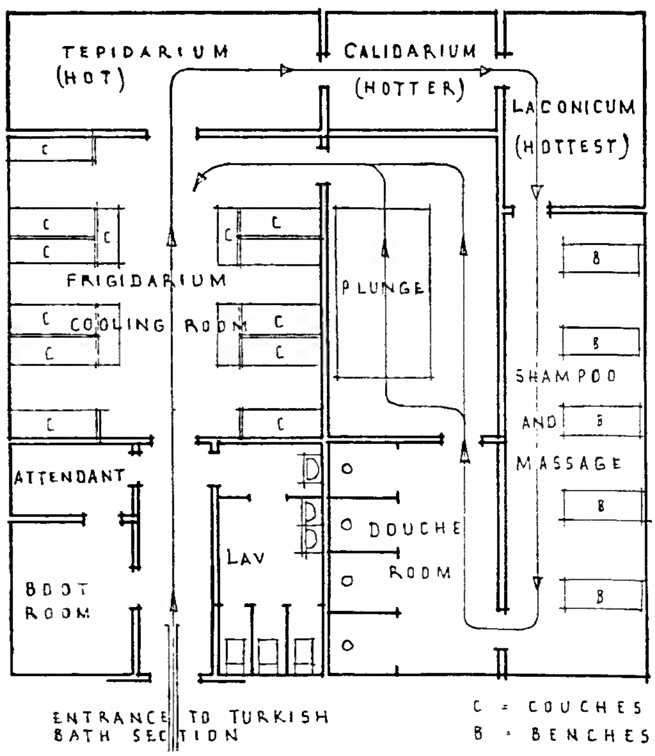



Fig. 12 Turkish bath: circulation

they need large amounts of steam and hot water, should be situated as near the main heating apparatus as the plan will allow. Daylight is not needed in the majority of the rooms and careful consideration has to be given to heat insulation of all the hotter rooms; a position in the basement of the building is frequently adopted.

**Turkish Baths**

The usual layout and circulations needed in a Turkish bath are illustrated in Fig. 12. The bather, having taken a ticket at the entrance hall ticket office, proceeds to the waiting room or lobby at the approach to the Turkish bath suite; in this lobby he gives up the ticket to an attendant and usually removes his boots or shoes, which are placed in a boot-room or cloakroom next to the attendant's room. Some accommodation must be provided either at this point or at the main ticket office for storage of personal valuables; this provision should be in the form of small lockers. The attendant's room has to be equipped for the preparation of light refreshments, unless there is a kitchen or café in close proximity to the cooling room.

The bather enters the cooling room, where he undresses and passes to the baths proper, which are usually three rooms of which the temperatures are gradually increasing. From the hottest room the bather passes to the shampoo room, where he may receive massage; after which he enters a room containing douche, spray or shower baths and usually a small plunge bath. After the baths the bather returns to the cooling room and rests on a couch for a considerable time.

The boot-room is often used also as a cloakroom for clothes storage and, as such, must be controlled by the attendant. Some schemes provide a separate room or cubicles for dressing, apart from the cooling room, instead of allowing bathers to dress in the actual cooling room as is necessary in the type shown on Fig. 12. Both of these rooms, when provided, should be well lighted, by daylight if the greatest efficiency is to be obtained. Very great care also has to be taken in the selection of materials both for construction and for finishings.

The shampooing room is fitted with a series of marble massage slabs on marble pedestals about 6ft. 6in. by 2ft. with a small lavatory basin placed near each pedestal. The floors and walls must be covered with impervious materials and the former laid to falls to remove the surplus water rapidly. The massage slabs are best if placed with one short end against the wall for circulation round the bather, but sometimes they are planned with a long side against the wall.

The baths following the massage are more usually of the shower type with a small plunge bath in addition; this plunge bath does not need to be more than about 8ft. to 12ft. long, 6ft. wide, and 4ft. 6in. deep, with steps down at one end.

Dressing cubicles are usually formed of teak partitions 7ft. high above the floor and kept 6in. clear of the floor at the bottom for cleaning. A space about 4ft. by 4ft. is desirable in each cubicle. The equipment should comprise a fixed seat 12in. wide and 18in. high, mirror and clothes-pegs.

W.C.s and urinals should be provided at the rate of one W.C. and two urinals for every eight couches; they should be easily accessible from the cooling room.

**Russian Baths**

These are very similar to Turkish baths and contain a boot-room, attendant's room, cooling room, hot room, steam vapour room, shampoo room, all similar to those described above except the steam room, which is equipped with a series of fixed seats in tiers. The general scheme of circulation is also similar to Turkish baths.

Russian baths are sometimes combined with Turkish baths, thus using the same shampooing room, shower and plunge baths, and cooling rooms.

**Laundries**

Central communal laundries are intended to provide facilities for laundry services to be operated by the user. The demand for such installations has arisen mainly where it is difficult or impossible to provide adequate facilities in the home and in heavily populated urban areas, especially those with older houses with inadequate provision for laundry work; these facilities have been widely provided for many years. A special attraction to the user is that mechanical plant, which reduces greatly the labour involved, can be provided at a cost which tends to be excessive if used by one household only. Laundries are probably more acceptable when associated with blocks of flats (*see* section on "Flats") than with houses, as in the latter it is necessary to carry, usually through the streets, the linen, etc., to and from the laundry.

It has been customary to attach laundries to public baths to economize fuel and staff. The development of the domestic types of washing machine is changing the equipment of the laundry very considerably from what it has been in the past. Until recently the normal equipment has been a series of cubicles each equipped with a single or double laundry-tub, draining boards, a wringer and a wash boiler. To every eight or ten cubicles a hydro-extractor has been installed, together with drying horses in a heated compartment. Drying horses have usually been provided at a rate of two for each cubicle.

The change of equipment is the installation of the newer types of washing machines, which carry out all operations up to and often including rough drying, ready for ironing, in the separate cubicles; in some instances these cubicles have been formed with wire mesh divisions instead of the normal heavy types of material such as glazed brick. The cubicles should be not less than 7ft. 6in. by 5ft. unless it is decided to provide also a laundry tub and a wash boiler; the latter is often considered desirable as few washing machines are designed to boil the contents and many Health Authorities feel that certain articles should be subjected to this treatment.

In the past, facilities for ironing both in the form of gas or electrically-heated irons and mechanical equipment have been included in the equipment of many wash-houses but others expect users to do this part of the work in their homes. The provision of ironing machines, particularly to handle the larger articles such as sheets, has obvious advantages in saving the labour and time of the housewife.

In addition to the space required for the actual laundering equipment, it is desirable to provide a children's room where the users' children under school age may be left to play while their mothers are using the laundry. It is normal to provide covered storage-space for prams as laundry is frequently carried to and from the wash-house in prams, in addition to carrying the younger children.

It is essential to provide toilet facilities in close proximity to the cubicles but cloakroom facilities are better in the

form of pegs in the individual cubicles so that the clothing is under the control of the owner.

Floor and wall finishes are of very great importance owing to the damp, steamy atmosphere and should therefore be of a hard impervious nature. Ventilation should also receive special attention.

Laundries tend to be a source of considerable noise and their planning should be such as to avoid inconvenience to neighbouring property.

### Open-air Swimming Baths

This section deals with the requirements of open-air swimming baths only, though much of the data is equally applicable to covered baths. There has been, in recent years, a very large increase in the demand for swimming accommodation; though many open-air baths for public and school use have been constructed, still more must be contemplated, since this type of bath can be provided reasonably cheaply and at the same time produce good revenue. Open-air baths attached to schools or private residences differ somewhat in requirements from the larger public baths intended to be used by large numbers.

### Sites

There are few important factors governing the selection of a site for an open-air swimming bath, but among the points to be considered are ease of accessibility from all parts of the town which it serves, with ample area to allow the proper provision of lawns, trees and car parks, when it is to be used as a separate unit.

In seaside towns the bath should be near the sea, as sea water is generally preferred by patrons; it should be placed in a prominent position readily accessible to the crowds and serve also as an attraction and entertainment. The two positions most frequently chosen are either the foreshore of the promenade (by enclosing an area of the beach or cliff-base) or adjoining the promenade on the inland side. There seem to be few particular advantages in favour of either scheme but, in the former, expensive construction may be needed to withstand the force of the sea, more especially in winter, while a drawback in the case of the latter position is the difficulty of obtaining a suitable site at an economic price.

In inland towns the swimming bath sometimes forms part of a park or recreation centre and is, therefore, one unit of a large scheme which makes it easier to provide pleasant surroundings to the bath, and allows economies to be made, by the sharing of car parks and cafés, since many patrons would use the bath in conjunction with other recreations.

### Types of Public Bath

Open-air baths may be divided roughly into two types; first, those used purely for bathing, and, second, those used for bathing, but providing accommodation for spectators; in the former class a few spectators may occasionally be admitted for special events, but in the latter definite provision is made for the continual attendance of spectators; this type is usually required in large seaside baths. Where spectators are to be provided for, consideration must be given to aspect, for they must not be so seated as to face the sun while watching special events, which generally take place in the afternoon. Fig. 13 shows the correct placing of spectators in relation to aspect, and it should be noticed that the position of the sea should not influence the placing of the spectators' stands. Three sides of the bath are frequently used for spectators; of these only two are likely to be satisfactory, as the north side has sun practically throughout the day and the east during the afternoon.

### Children

Provision should be made for young children to bathe, but the normal bath is often too deep for them to use; two alternative methods of making suitable provision are, either to have a separate shallow bath near the ordinary bath or to have a very large area of water with a shallow part divided off. This scheme has been adopted in some seaside places in order that parents and children may use the same bath. This shallow area of the pool is also very useful for non-swimmers, who form a definite percentage of the uscrs of public baths.

### Relation of Layout to Sun

It is desirable that during the months that open-air baths are most used, the whole of the water area should be constantly in the full sun and not partially shaded by dressing-boxes, spectators' stands or other buildings. Fig. 14 illustrates the placing of the buildings in relation to the water area and the sun on an east to west layout.

### Sunbathing

Each year more swimming-bath patrons wish to sunbathe, and ample provision for this should be made by means of sufficient space round the

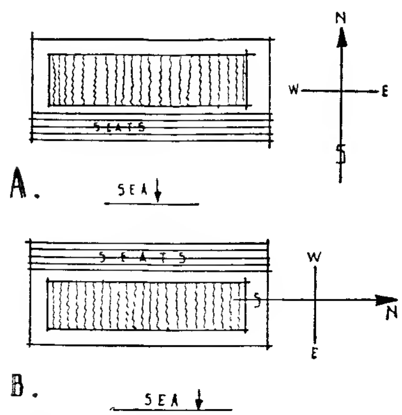



Fig. 13 Orientation for spectators

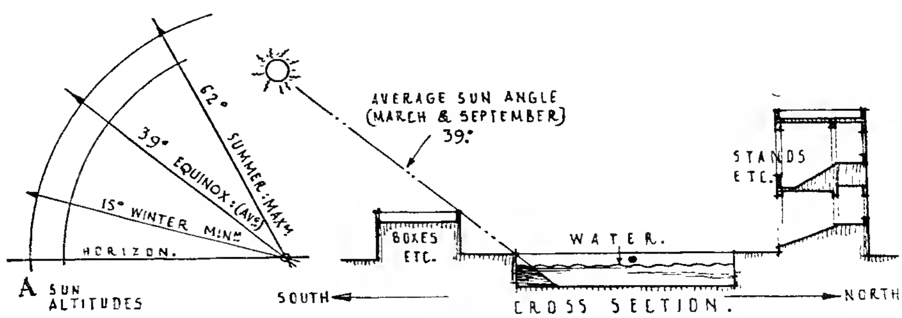



Fig. 14 Relationship of the layout to the sun

water area and on the flat roofs of any surrounding buildings such as the dressing-boxes. These sunbathing spaces should, however, be protected against wind as much as possible, and for this purpose trees will be found valuable, though they must not be of such height as to cast shadows over the lounging space, except in small areas; there should be some shaded space, however, for those patrons not wishing to lie in the direct sun, but the number of these appears to be small. Trees should not be placed so close to a bath as to allow leaves to fall into the water.

### General Circulation

The general circulation in open-air baths is simple, but is of two types; the one is used when few spectators are catered for and the other when spectators constitute a large proportion of the total number of persons. Fig. 15 illustrates the type in which spectators are not an important factor. In each example it is assumed that mixed bathing will generally be taking place, as the tendency appears to be to permit mixed bathing at all times when sufficient dressing accommodation is available. When mixed bathing is allowed the dressing accommodation for each sex must be properly separated and the circulation should be based on this principle. The entry should lead directly to the pay-box, after which the sexes separate, picking up, if they require them, towels and costumes, and passing to the dressing-boxes. The circulation to the dressing-boxes should not take patrons in their ordinary clothes and boots near to the bath, a matter which is discussed later. Lavatories for each sex should be attached to the dressing-boxes but should also be available to bathers without their having to return through the dressing-boxes, especially when sunbathing is permitted for long periods. Shower and foot-baths should be available between the bath and the dressing rooms. It seems most satisfactory to place the dressing rooms for one sex on one side of the bath and for the other sex on the other side, and the café, refreshment rooms or similar common rooms together with staff rooms separating the two at one end, and the entrance, with which may be grouped plant rooms, laundry, drying rooms, etc., at the other.

Fig. 16 illustrates the main circulations required when spectators form a considerable proportion of the visitors to a bath. Most baths of this type are fairly large establishments and it is, therefore, wisest to have one centrally-placed pay-box for both spectators and bathers so as to have all money under one control. This arrangement, however, usually means separating the issue of towels and bathing dresses from the pay-box, and tickets are issued at the pay-box and handed to an attendant in charge of the dressing-boxes, who gives out the bathing dresses and towels. Spectators should have very easy access to their seats without circulating in any part used by bathers. Bathers should pass from the entrance to their dressing-boxes without entering the parts of the bath used by those with bare feet to ensure that a minimum of mud and dirt is carried into the water. A usual arrangement for spectators is to seat them over the dressing-boxes, thus raising the lowest tier well above the level of the bath surround, a useful point when competitions or water polo matches are taking place, as the spectators cannot approach the performers or officials. If a café is provided, access must be equally easy from the bathing pool, the dressing-boxes and the spectators' galleries, but one part near the entrance should, if possible, be set aside for use by those with wet bathing dresses. In some seaside baths the spectators are accommodated at approximately promenade level over the dressing-boxes, and the pay-boxes are usually placed at the entrance level, thus allowing the bathers, who immediately proceed to the dressing-boxes at a lower level, to be separated easily from the spectators.

### Bath

For general public use the minimum length should be 60ft., but where championship events are to be held it is desirable that the bath should have a length of 165ft. (approx. 50 metres) and a width of at least 60ft.; the Amateur Swimming Association does not permit races exceeding 500yd. to take place in baths less than 165ft. long. The width of baths for championship events should be 60ft.; this width is also the maximum permitted for water polo and therefore wooden booms, which are difficult to fix temporarily, are not needed if the bath is limited to these dimensions; for championship baths a depth of 6ft. or 7ft. is required over the whole of the water-polo area, which is 30yd. long. For high diving a depth of at least 14ft., preferably 15ft., is necessary over the whole of an area extending 25ft. horizontally from a point immediately below the end of the highest board. Three feet is generally considered the minimum water depth in which races can take place, but in many public baths provision is now being made for very young children either in the same bath or in a separate one with a depth increasing from 1ft. 6in. The maximum depth of a bath is largely dependent on the diving apparatus provided; the highest diving stage should not exceed twice the depth of the water. The edge of the bath or take-off should not be more than 18in. above the water level.

The deep portion of the bath is generally at one end, as shown in Fig. 19, except in very large schemes where it is sometimes in the centre, as in Fig. 18 which illustrates a typical section of this type, or sometimes in a special position as in the plan illustrated in Fig. 14. The dimension of 4ft. given in Fig. 19 should be considered as the greatest permissible for shallow ends. The baths are sloped to the draining points which in smaller baths are often placed at one end, as suggested in Diagram A, but in larger ones it is usual to adopt schemes B or C in Fig. 19 or that shown in Fig. 18.

### Shapes of Pools

The usual shape of pools is rectangular with the length about two or two and a half times the width when sections such as those in Fig. 19 are used, but there is an increasing tendency in the larger schemes to use rectangular pools more square in shape with a section such as that shown in Fig. 18. Fig. 17 illustrates four different types of plan for swimming baths, example A being the common rectangular type, with deep water at one end; example B has deep water in the centre, and therefore the diving stages are placed at the centre of the long sides with the water polo space centrally. Examples C and D illustrate schemes adaptable for very large pools, particularly if water polo matches, diving exhibitions or racing events are to take place while the remainder of the water is being used for general bathing; each example has different merits but in each case non-swimmers may easily be separated from swimmers, particularly in example D

## OPEN-AIR SWIMMING BATHS

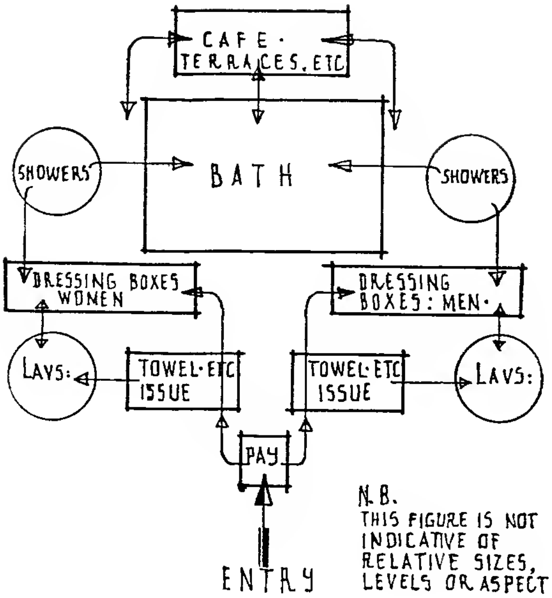



Fig. 15 Layout (without large area for spectators)

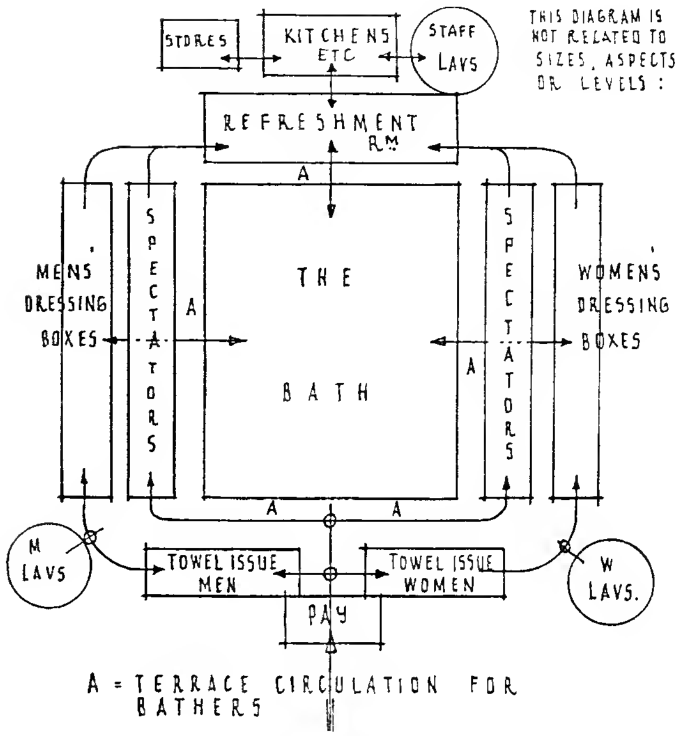



Fig. 16 Layout (with area for spectators)

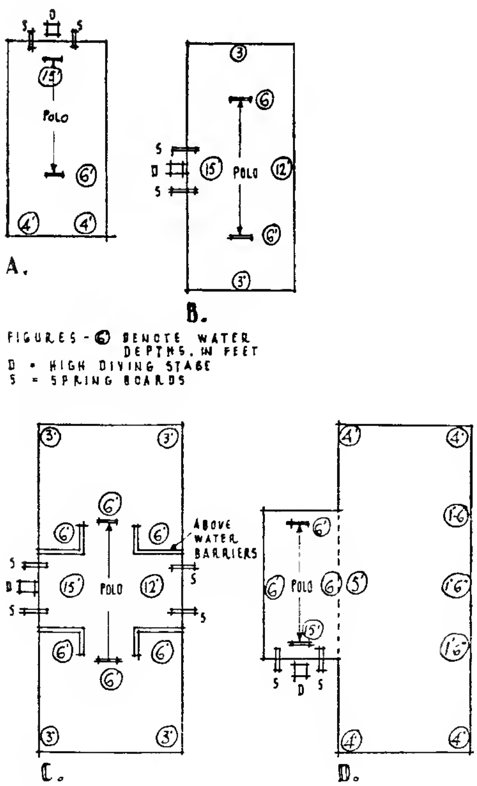



Fig. 17 Typical pool plans

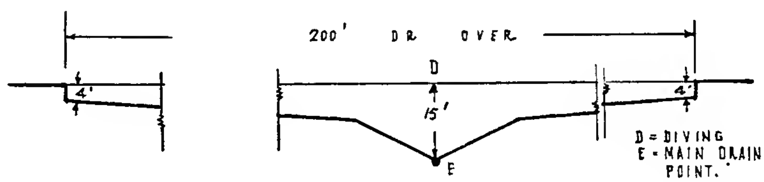



Fig. 18 Typical large bath section

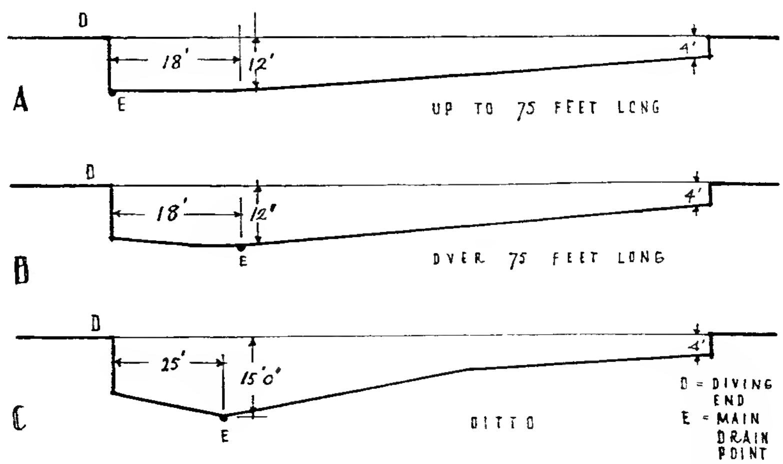



Fig. 19 Typical bath sections

where all the deep water may be cut off by barriers from the rest of the bath. The placing of the deep water space to one side allows a very satisfactory lay-out for spectators' seats all in close proximity to the water, whereas in example C the racing and polo space is more difficult to see. This scheme does, however, allow a greater length for racing than scheme D, in which the main part of the water area is too shallow for swimming events and is intended mainly for children and non-swimmers.

### Capacity of a Pool

Water area allowance has to be made in accordance with the anticipated number of users, and figures are somewhat difficult to assess, but one American authority suggests an allowance of 36sq. ft. per adult swimmer: but, assuming one-third of the swimmers will not be in the water at any one time, an average of 27sq. ft. should be provided for each swimmer at the time of the maximum use. In connection with assessment of space, the areas near the diving boards cannot, in fact, be much used for swimming as it is dangerous for more than two or three persons to be in the water at one time. Non-swimmers only require an area of about 10sq. ft. per person.

Baths are also constructed in circular or elliptical forms and this is said to be very satisfactory for pools used by crowds or family parties, as there are varying water depths to suit all comers; it has been stated that only 25 per cent of the users of public baths, especially at seaside places, are swimmers. The advantages of a circular pool are that the shallow water all round the edge prevents non-swimmers falling into deep water and also, if the diving platform is placed in the centre, only swimmers are able to reach it. It is desirable, however, to have a rectangular pool at one side or adjoining for displays and racing.

### Pool Construction

The majority of pools is constructed of reinforced concrete of varying thickness, depending on the surrounding site conditions. Reinforced concrete has the advantage of low first cost and may be in itself waterproof, although only a few inches in thickness. The finished lining surface is the important factor; many finishes are available, but consideration has to be given to initial cost, upkeep, and cleanliness. The surface should be one which is smooth, so that dirt does not collect on it, and which does not crack; joints should be reduced to a minimum, and the whole should be capable of easy washing down. Marble, glazed tiles, and terrazzo, which are often used for covered baths, are generally too costly for open-air baths and are liable to damage by frost, although open-air baths are generally emptied in the winter months. Ordinary cement-rendered surfaces are liable to crazing and are difficult to clean, but a polished rendered surface, or one made by pre-cast polished blocks backed with mass reinforced concrete, can be cleaned very easily by washing only. The concrete surfaces may be finished with brushed or sprayed glazing materials, but the life of these materials is not yet known to be very long. A light-coloured material is desirable for pool linings.

Frequently a different coloured band of cement, tiles, or mosaic is placed at about the level of the water line or extending from a little below the water line to the top of the bath; this band is used in order to protect the surface lining at the point at which scum may accumulate on the water, and consequently more and easier cleaning is needed. Its colour is often chosen to make scum less noticeable.

### Markings

The varying depths of water in the pool should be clearly marked in positions easily seen by those in the bath. It is general to mark only increases every foot in depth and the depth at each end.

Swimming lanes should be clearly marked on the bottom of the pool; they must be at least 5ft. and are usually about 6ft. apart, the outside line being placed 3ft. from the outer wall of the pool. The marking is generally carried out with dark colour bands in the same material as the lining of the pool or in tile or mosaic. It is usual to finish the lines at 4ft. or 5ft. from the ends (approximating one stroke) and to emphasize the end by a square mark or a continuous cross-band. The lane markings are generally 3in. wide, and it should be remembered that swimmers race over the lines and not between them. Distances should be marked in figures along the length of the bath.

### Steps

Steps should be provided, but they should be either removable or recessed into the wall of the pool for special occasions. Steps are usually made of teak and even then are often covered with non-slip materials such as canvas or fibre matting. The permanent steps may be recessed into the walls of the pool, as shown in Fig. 20, when they may be constructed of concrete, or non-slip tiles or wood as a part of the sides of the bath with recesses formed to receive the feet. Occasionally ordinary flights of steps are built in shallow places or recessed into the sides of the bath; these are not, as a rule, very satisfactory and present difficulties in regard to non-slippery surfaces. Steps flush with the wall of the pool prevent injury to swimmers, which may happen where steps or ladders project into the water.

### Handrails

Continuous handrails placed just above water level should always be installed unless the scum-trough is designed to incorporate a substitute for the rail. The rails are generally 2in. diameter galvanized metal barrel and require very strong fixing to the walls or decks, as they are used by bathers for getting out of the bath. Hand or grab rails should be provided at the top of each set of steps; these rails are generally constructed in the same way as the bath handrail.

### Scum Gutters

It is desirable to place scum gutters round all sides of the pool, so that any impurities which float on the surface may be drained away. In some cases the gutters are placed at one end of the bath only, but this has not proved satisfactory. There are two main types of scum gutter—open and recessed. Fig. 21 illustrates three common sections, the outside examples of which are recessed and the inner one is open. The edges of all types should provide some form of hand grip. It is claimed that the open type is less dangerous to feet and legs and is cheaper to construct. The " roll out " type, although frequently adopted in cheaper construction, has the risk of being insanitary, more especially if the gutter itself is not deep and may therefore choke with dirt and water from the sidewalk round the pool. A further disadvantage of this type is the difficulty of standing at the edge of the bath with comfort.

Of the recessed types the goose-neck section practically eliminates the risk of knees or feet being injured through becoming wedged in the recess; the gutters themselves should be deep to prevent water splashing back into the bath and the top edge should be slightly set back so that water from the platform level drips into the gutter. Good falls and drainage outlets at about 10ft. centres should be used for the rapid removal of water. In some baths a band of non-slip material is provided at each end just below the scum band as an aid to swimmers when turning.

### Coping

The coping or edge of the pool should be non-slip tile, mosaic or other rough surface, since materials such as marble or terrazzo are extremely slippery and dangerous when wet.

### Sidewalks

Sidewalks round the bath should be at least 4ft. wide at the sides and 10ft. at the ends; they must be sloped to fall to drains placed as shown in one of the two diagrams on Fig. 22, in order to prevent dirt entering the pool. There is little preference in favour of either scheme, as each has its merits; the upper type is not too satisfactory, due to the placing of the gutter near the pool, but has the advantage of the drainage being placed nearest the source of the water, which should tend to keep the sidewalk drier. The scheme shown in the lower diagram has the gutter in a less dangerous place. It should be made impossible for visitors other than bathers changing for swimming to pass on to the sidewalks, and, if sunbathing lawns and terraces are placed adjoining, barriers should be erected to force bathers to pass through a foot-bath before entering the pool itself. The main portion of the sidewalk other than the coping to the pool should be paved with a material which is impervious, easy to clean, and non-slippery. Natural stone, cement with non-slip surfaces, mosaic and ribbed tiles, have all been used with fair success in various open-air baths. The sidewalks should be of a light colour and of a different colour from walks used by non-bathers.

### Diving-boards

Swimming baths are usually equipped with some type of diving-board. To

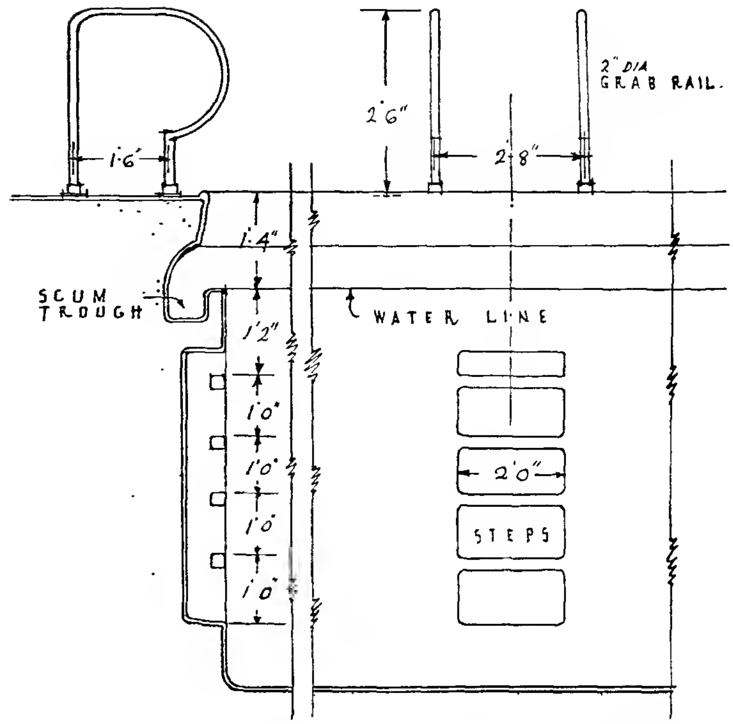



Fig. 20 Typical steps, etc.

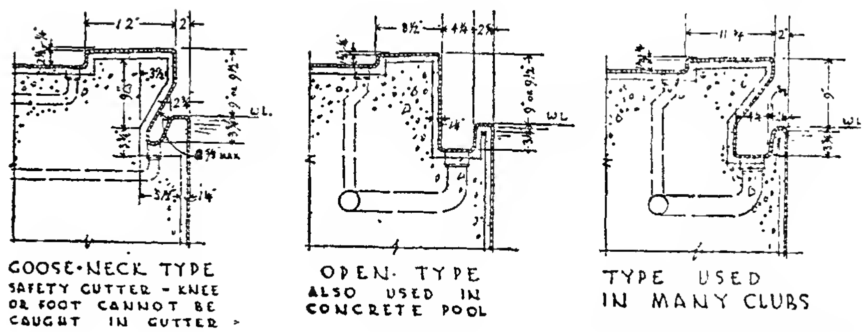



Fig. 21 Sections through typical scum troughs

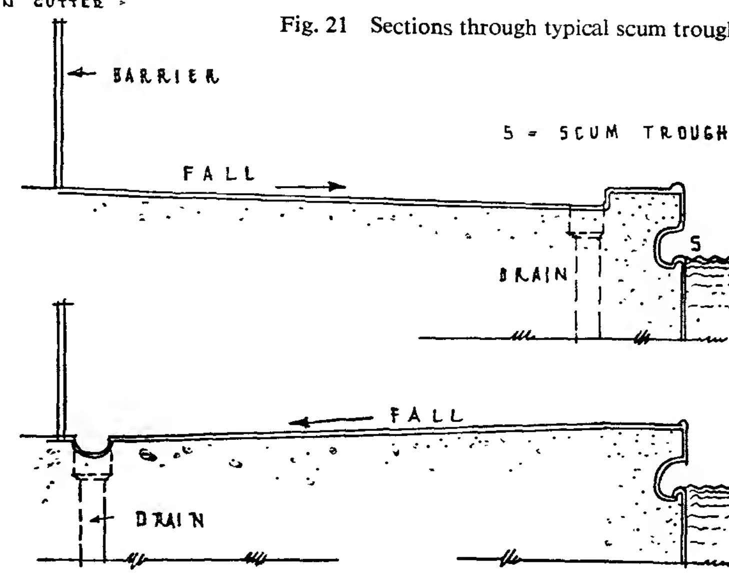



Fig. 22 Sidewalk drainage

ensure safety, the heights are fixed entirely by the depth of water, which should be a minimum of 7ft. Generally speaking, the heights of stands or boards should not exceed twice the depth of the water, but a greater depth than 15ft. is seldom needed, as the usual maximum height is 32ft. 9½in. (10 metres) above water level. The greatest water depth should be 15ft. to 20ft. distant from the end of the diving-board. Boards are generally of two types, firm and spring; boards up to 10ft. above the water are generally made to spring, but are fixed for heights above 10ft. For international events the following heights are usual:—Spring boards: 1 metre (3ft. 3½in.), 3 metres (9ft. 9½in.); firm boards: 5 metres (16ft. 4½in.), 10 metres (32ft. 9½in.).

Many baths, however, have boards both fixed and sprung at various other heights for practice and teaching. Divers prefer boards with a run-back of about 16ft., and overhanging the water at least 6ft. beyond the edge of the bath. Boards which overhang near water level should be made movable for special racing or other important events. Care must be taken in placing boards so that the risk of one person diving on to another is minimized.

### Spring Boards

There are two main types of spring board; firstly, the ordinary type which is made of pitch-pine, or a flexible hard-wood such as ash, well seasoned and oiled, 20in. wide and 3in. thick, covered with coco-nut matting and held down by metal clamps at both back and front points of support; secondly, the international types, some of which are of steel, but the majority of Oregon pine. The three-metre board is 16ft. long: the one-metre is usually 14ft. long. Each is 20in. wide and 3in. thick from the back fixing to front support, beyond which it tapers to 1½in. in thickness. The boards are held down only at the back and only rest on the intermediate support, which is placed about 8ft. 9in. from the diving end of the three-metre board, and 8ft. from the diving end of the one-metre board. A rise of 6in. in the board is general (*see* Figs. 23 *and* 24).

### Firm Boards

These are generally made of teak, oak or mahogany, and are covered

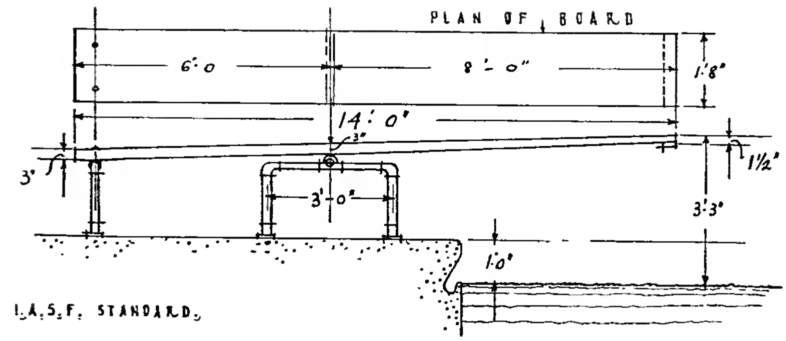



Fig. 23 One-metre spring board

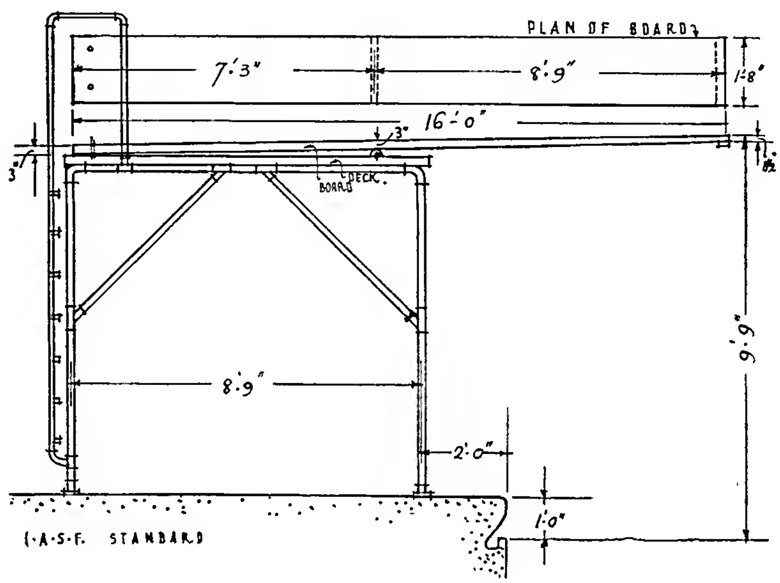



Fig. 24 Three-metre spring board

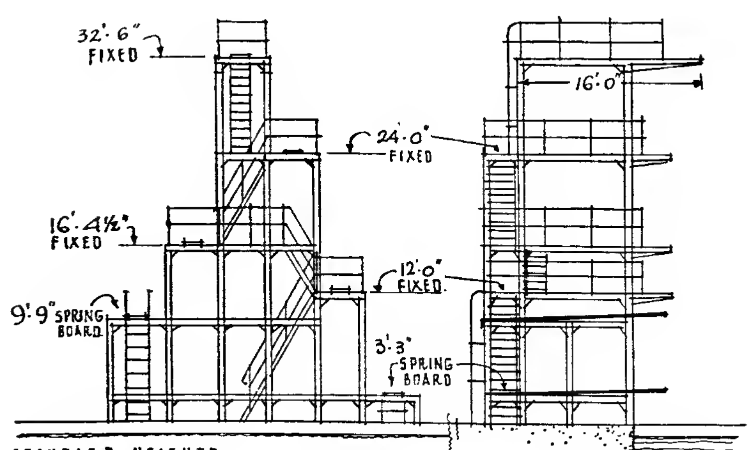



Fig. 25 Diving stages

with coco-nut matting, fixed so that there is no risk of injury to feet.

**Diving Stages**

Diving stages are placed in one of two different positions in large open-air baths; firstly, at one end or side, or in the water away from the edge of the pool. Platforms should have 16ft. clear run and should be about 4ft. 6in. in width, although the International Federation requires 6ft. 6in. The platforms should have railings on three sides, finishing at least 3ft. from the diving end of the board. A strip of coco-nut matting, about 20in. wide, should be fixed on the centre of each platform for the full length of the run. The diving stages may be constructed of timber, metal or reinforced concrete with steps to each level, preferably outside the spaces required for the runways. The platforms are usually placed at the following heights: 32ft. 9½in. (if water depth permits), 24ft., 16ft. 4½in. and 12ft., with spring boards, adjoining or incorporated, of 3 metres and 1 metre (*see* Fig. 25).

Frequently, diving stages are not made to provide the requirements of the International Amateur Swimming Association, particularly in schools and smaller pools. Full-length runs are not provided, nor full-width platforms, but types in which the platforms do not project adequately over the water should be avoided. Platforms, except at great expense, have to be placed over one another in many cases, but each stage should project 2ft. beyond the one below it. Diving-boards 18in. to 20in. wide are often fixed on to the platforms, but are not permitted for international events.

**Water Chutes**

These are very popular with bathers and should be installed in all public open-air baths. Types are now made which need not be used only in deep water. The chutes are generally constructed of metal supported on metal or wood framing, with wooden ladders. In large baths, ample platform space should be provided for persons waiting at the top of the chutes so as to avoid waiting on the approach ladder. The towers are made in various heights up to about 20ft., with chutes 30ft. or more long. The chutes are sometimes designed to terminate near the side of the bath—a great advantage to users who are not expert swimmers.

**Rafts**

These are sometimes provided in very large pools and either have flat tops or are equipped with a raised portion for diving. Proper provision for gripping the raft should be made in the form of rope handles, and a coco-nut matting cover should be used.

**Other Equipment**

Near the pool provision should be made for the following equipment:— a clock, easily visible from all parts of the bath and its surrounding walks and sunbathing spaces; life-saving equipment—lifebuoys and poles with hooks; first-aid equipment and drinking fountains, the latter being essential in salt-water pools.

**Dressing Accommodation**

This accommodation may be provided in many ways, the selection of which is dependent mainly on the anticipated number of bathers and their class. At schools, and for children attending large public baths, communal dressing rooms are often provided, consisting only of a large room with a seat placed round the perimeter with hooks above it and isolated seats and cloak stands in the centre, if space allows. For cheapness this equipment is often carried out in deal coated with preservative, and with japanned metal fittings, while in rooms more expensively equipped teak is generally used, with bronze fittings. The seats, being used sometimes by children, should be fixed about 1ft. 3in. above the floor and need only be 12in. wide; they should, if possible, be fixed clear of the floor, which has to be swilled with water for cleaning. The clothes hooks should be of the hat-and-coat type and should be placed about 12in. apart in single rows about 5ft. 6in. above the floor. This type of dressing room is also provided for swimming clubs and similar groups of persons, when seats should be 18in. above the floor and hooks should be placed at 18-in. centres. Provision should be made for leaving valuables, etc., with attendants.

Communal dressing rooms or rooms fitted with dressing-boxes should be well lighted, and very well ventilated. Floors should be of impervious materials laid with slight falls to channels. All dressing-boxes must be covered as a protection against rain.

There are several layouts based on the dressing-box, the most common being the surrounding of the bath with separate boxes; the alternatives are based on the grouping of boxes, either inside rooms or at least under cover.

Dressing-boxes should be at least 3ft. centre to centre, and 4ft., but better 5ft. long, as in the former length doors must open outwards and are liable to cause damage. Partitions are generally 6ft. 6in. high, although they are in some cases reduced to 5ft. only, and they should be kept 6in. clear of the floor for cleaning. Doors are sometimes the full height of the partitions, but more often only 4ft. 6in. high and 6in. clear of the floor. Partitions are most satisfactory if made of teak, but terrazzo and metal are also used in many examples. A cork or slat-constructed teak mat is desirable on the floor owing to wetness and the coldness of terrazzo and similar flooring materials. A seat is essential, preferably the full width of the box and about 12in. deep, placed 18in. above the floor, but it should be clear of the floor, and not of the locker type. Other equipment should consist of a small shelf, a mirror and at least one, preferably two, coat-and-hat hooks.

The boxes may be arranged on two principles. In small baths where only a limited number can bathe at one time each bather may have a separate box in which he undresses and leaves his clothes as in Fig. 26; in the second method the bather undresses and hands his clothes to an attendant, leaving the box free for use by other bathers while he is in the water; such an arrangement allows a reduction of boxes as one is sufficient for 15 to 20 bathers, and is therefore specially useful in seaside towns, where some people stay on the premises half the day or more, and for large baths. The system as illustrated in Fig. 27 works in the following way: On entering the bath the bather is given a paper or linen bag in which he places his clothes after undressing in the allotted dressing-box; when undressed he signals to the locker room attendant who takes the bag containing the clothes through the small service door in the back of the box, and gives him a disc or key of the clothes locker in which the bag is placed; this key he wears on his wrist or round his neck whilst bathing, during which time the dressing-box may be used by others; on leaving the water he enters a vacant box, signals to the attendant who returns his clothes through the service

door in exchange for the disc or key. The lockers may be 1ft. 3in. square on plan and 2ft. high if the bags are hung inside them. In some cases lockers are not used but hooks on which the bags are suspended. Paper bags, used once only, are preferable from the point of view of cleanliness. The disadvantage of the system shown in Fig. 27 is that those wearing boots circulate upon the same floor as those with bare feet; this should be avoided for reasons of cleanliness. Another type of locker system is that shown in Fig. 28, where the lockers and dressing-boxes are placed in the same room; each person is either given a key to a locker on entering the dressing room or, after undressing, is allotted a locker; in each method the key is carried while bathing. Locker numbers should be prominently displayed on the ends of tiers to avoid the employment of attendants for guidance; it is also important to display notices giving full instructions on keys, lockers and dressing-boxes. General circulation marks or arrows inlaid in the floors might prove of material assistance.

Fig. 26 also illustrates a system to avoid circulation of those in boots over corridors used by barefooted bathers. The boxes have doors at each end and the circulation passes through them as shown. The bather enters a box on one side, locks the door, undresses, and leaves the box on the other side into a passage leading only to the bath. Similarly on his return he can only enter the dressing-boxes by the "wet-way," dress and leave the box on the other side on the "dry-way." By proper screening it is impossible for anyone to get into the wrong circulation.

**Lavatories**

Lavatories, W.C.s and urinals are mainly used by bathers and, therefore, if circulations are divided into "wet" and "dry" they should be placed adjoining "wet" corridors.

Lavatory basins should be provided at the rate of 1 for every 60 bathers, calculated at the times when the bath is full, and W.C.s at the rate of 1 for every 40 females, and 1 for every 60 men with 1 urinal per 60 men in addition, calculated in the same manner.

**Showers, etc.**

Shower baths should be installed in a prominent position between the dressing-boxes and the bath at the rate

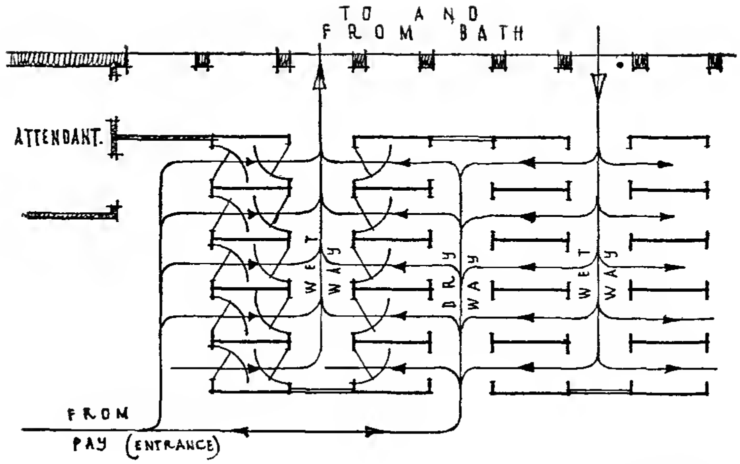



Fig. 26 Dressing-boxes

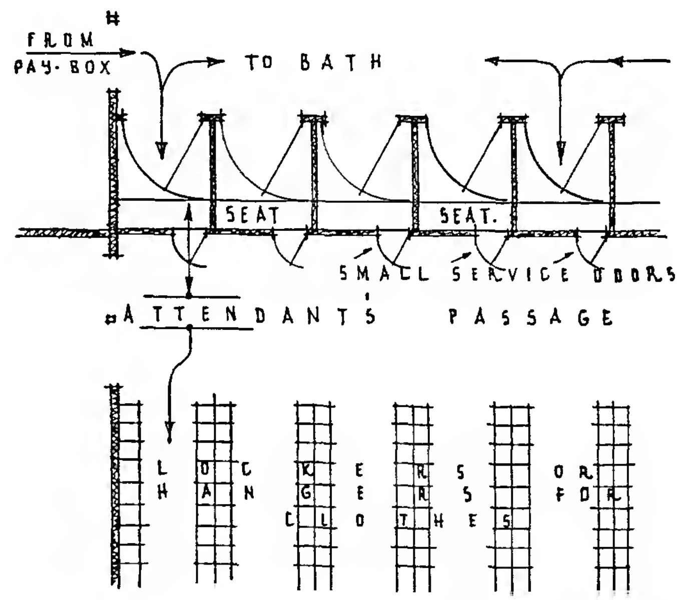



Fig. 27 Dressing-boxes

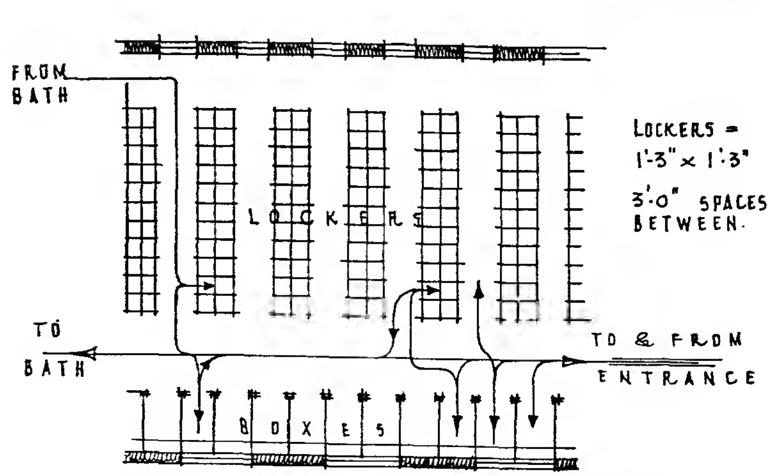



Fig. 28 Dressing-boxes

of at least 1 per 40 bathers at peak periods. The position should be such that bathers are encouraged to use the showers before entering the bath. In some baths on the Continent, shower and foot baths are compulsory before bathing. Foot baths should also be encouraged and their use forced on bathers by making access to the bath only possible by passing through a foot bath of continuously running water. The latter is essential where bathers cross grass before entering the bathing pool.

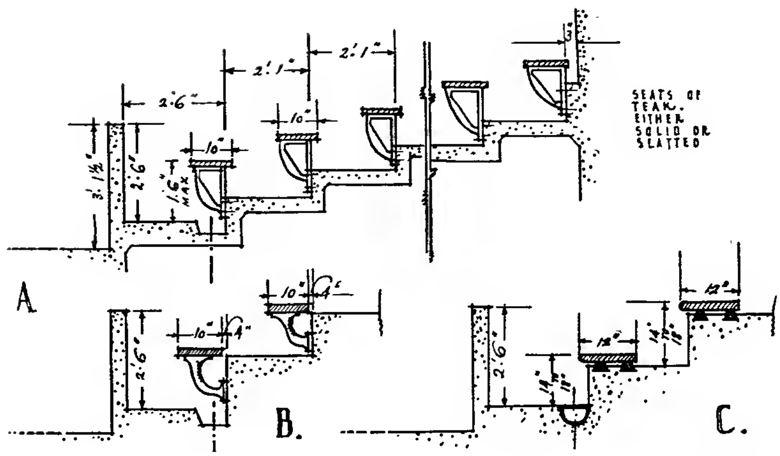



Fig. 29 Seating for spectators

**Spectators' Accommodation**

The placing of spectators' seating has already been discussed earlier in this section. They should have separate entrances in very large schemes or should be separated from the bathers after passing the pay-box at the entrance and in no circumstances should have access to the pool surround. Where spectators are to be admitted in large numbers proper seating accommodation is needed, separated from the bathers' accommodation by a barrier or low wall. Seating should be placed so that the users have their backs to the sun, and on one long side only, if possible, leaving the opposite side free for officials during competitions and water polo matches. The flooring of circulation spaces should be coloured or paved with different materials to differentiate between circulations used by bathers and spectators. The lowest tier of seating should be raised well above the walking space surrounding the pool and seats must be raised so that each spectator has a proper view of the edge of the pool nearest to him, which is often achieved by placing raised tiers of seats over the bathers' dressing accommodation. It is preferable that some, if not the whole, of the spectators' accommodation should be covered, mainly as a protection against sun, which will be on spectators' backs, if the seating is properly orientated, but such cover is also desirable against sudden storms and showers. Entrances and exits to seats should be generously allowed to minimize disturbance and all gangways should be of ample width.

Fig. 29 illustrates three common methods of providing seating accommodation for spectators; occasionally only tiers of concrete steps are provided without wood seats, and cushions, if required, may be hired at additional cost. Backs are seldom provided to seats except in a few semi-private baths attached to institutions such as clubs and universities. The omission of backs is due to the fact that spectators seldom use them if provided and the omission allows of lower first cost and reduced maintenance; seat spacing should be slightly increased if seat backs are introduced. It is stated that there is a greater risk of accidents to spectators who stand up and fall across the backs. The steps on which the seating is placed should have slight falls for drainage purposes and a gutter is, therefore, required at the lowest level either as shown in Diagram A in Fig. 29 when a wall is used to separate the spectators, or a single gutter may be used to drain both the tiers of seats and the pool sidewalk if only barriers are used. Seats are, however, most satisfactory if made of teak or other hardwoods either fixed to metal frames or directly to the concrete steps; the seats may be constructed, if not too wide, in the solid, but more generally a slat type of construction is adopted and this has the advantage of drying more rapidly after rain.

Types A and B, Fig. 29, both illustrate seats supported on metal framework; there is one great advantage of Type A in that persons seated in one row are not kicked by those behind them, as may so easily happen in Type B. Type C consists of seats fixed to battens embedded in the concrete steps; when solid seats are used the battens are usually placed as shown on the figure and must have spaces at intervals for cross drainage, but with the slat type seat the battens are usually fixed from front to back in order that the front of the wood seat may overhang the face of the concrete riser.

Seating accommodation should be based on the assumption that each person requires 18in. run. Seats should be placed 14in. to 18in. above the level of each tier, the latter being more general as less knee space is required than with the lower seats; seats over 18in. high are generally considered uncomfortable. As shown on Fig. 29 a seat spacing of 2ft. 1in. back to back is sufficient except for front rows adjoining barriers or walls which should be increased to 2ft. 6in. Seats are generally 10in. to 12in. wide, the former being usual. In Type B, where the seat is placed so near to the level of the feet of the spectators in the row behind, a space about 4in. wide between the edge of the step and the back of the wooden seat is desirable.

**Spectators' Lavatories**

Adequate provision of lavatories and W.C.s is needed for spectators, separated from the bathers' accommodation, and therefore placed adjoining the circulations to and from the spectators' seats.

**Night Lighting**

Open-air baths are often used after darkness has fallen and provision must, therefore, be made for artificial lighting. One of the usual methods is to fix floodlights to tall posts round the sides of the pool; these posts should be placed in such positions that they will not interrupt the walking ways surrounding the pool, where they might be dangerous, especially if near the edge of the water (Fig. 30). The height and spacing of the posts is dependent

on the size of the pool, but it is essential that the lighting area controlled by the lamp reflectors covers the entire water and that bathers walk or swim in evenly distributed light. Lighting is also required for the spectators' seats and it must be so placed that it will not interfere with good vision of the bath itself, and, therefore, lamps situated behind the spectators are most satisfactory. Steps used by spectators, if not otherwise well lighted, may be provided with internally lighted glass risers. Dressing rooms and boxes also need artificial lighting for night use and on very dull days. Unless the partitions and doors of dressing-boxes are carried up to the ceiling individual lights are not needed and one lamp placed on the partition may be shared by two boxes; the dressing rooms are seldom sufficiently high to permit of the use of general lighting from centrally placed high-power lamps.

### Under-water Lighting

Under-water lighting has not been very greatly used in this country, although there are a few baths so equipped, but elsewhere many experiments have been made with considerable success. Care should be taken to select suitably waterproof apparatus. The lighting units must be placed at least 2ft. 6in. below water level so that they are below the level at which swimmers push off from the bath side; the greater part of the lighting is usually placed along the long sides of the bath with additional units at the deep end. The units are generally equipped with lenses or reflectors constructed to spread the light evenly. Units are placed about 10ft. apart where large lights are wanted, as on the sides of the bath, and 5ft. apart at the deep end where less penetration but a great spread is needed, due to the extra depth (*see* Fig. 31). There are various methods of installing the units, two of which are shown on Fig. 31.

Type A consists of recessed boxes containing the lamps which are let into the sides of the bath and Type B is by means of lamps placed in a pipe duct or walking-way shining through glass panels bedded in the walls of the pool. The latter method appears to be more expensive and therefore mainly suitable for large schemes.

When under-water lighting is used, the intensity of overhead lighting on the water surface must be carefully arranged, or bad surface reflections may destroy the effect of the under-water lighting. A smooth and light-coloured pool lining surface is also very necessary to obtain full benefit from under-water illumination.

### Treatment of Water

It is necessary either to have the water in the pool changed at short intervals, or to provide a filtering and sterilizing plant through which the water is constantly circulated.

The old method of filling the bath, and using the water for a period of anything from one day to three weeks and then draining it away, is not only very liable to be unhealthy, but is also expensive, especially if the water has to be brought for each filling; the water also presents a very unattractive appearance to patrons. In some baths river water is circulated without treatment, whereas in others the river water is pumped out of the river, filtered and passed through the bath back to the river, in each case ensuring constantly changing water. Seaside baths are sometimes constructed with the outer walls below high tide level and thus the water changes twice each day; the objection to this system is that sand and seaweed enter the pool and the outer walls may also be dangerous to swimmers, as they are apt to become very slippery. Other seaside baths pump sea water into large settling tanks, which allow sand in suspension to drop; the water is then either used to make up the pool water level, and a proportion of the water which is constantly being returned to the sea, or as "make up" water on a normal circulation system. The period of time in which the whole water content of the bath should be passed through the filters is varied, mainly in proportion to the number of bathers; in most baths the period should be about four hours, but in large open-air schemes a rather longer period, such as seven or eight hours is general. Natural purification can only be relied upon when the pools are so large that full development of natural pond vegetation may take place and when they are fed by sufficient spring water to make up for evaporation. There are a few baths fed by natural springs, but as a rule the water is too cold for use without heating. The fill-and-empty system, when new water is only introduced occasionally at about weekly periods, is very unsatisfactory in every way, while daily filling, except in sea and riverside examples, may prove too heavy a tax on local water supplies. Where filtration plants are not provided, chemicals, such as chloride of lime and copper sulphate, may be added to the water, but although odours may be eliminated and appearance maintained, the water may still be bacteriologically unsatisfactory.

### Continuous Filtration

The main point about a filtering plant is that it should be capable of dealing with overloads at rush periods, when a complete turnover of water may be necessary in 3½ hours or even less. All plant units which are liable to breakdown, or which have to be taken down for periodic cleaning or renewals, should, if possible, be in duplicate.

The circulation in a typical installation is as follows: From the deepest point water is drawn by a motor-driven pump, which is itself protected by a coarse strainer intended to remove such matter as leaves, hair, buttons from bathing costumes, and any solids which might be liable to damage the pump. A useful type is available with a quick-release cover, through which the wire basket strainer unit may be readily removed. After straining, coagulants such as sodium carbonate and sulphate of alumina are added in small quantities to the water by means of "dosing-pots"; these coagulants produce an insoluble gelatinous precipitate (hydrate of alumina), which is retained as a film on the surface of the filter sand, sealing its interstices.

The filters themselves generally consist of at least two units, preferably more in large schemes, the filtering medium being sand, shingle, or crushed quartz. The filtration rate should not exceed about 200 gallons per square foot per hour and thus the filter size depends on the turnover rate and size of bath. Both gravity and pressure filters are available, but the water flow is slower through the gravity type, which therefore requires more space. The filters are cleaned by reversing the flow of water and carrying the effluent to

sewers; at the same time the sand is turned over by a compressed air scour or by mechanical agitators. The interval between cleanings is variable, but a pressure gauge in the pipe line indicates the condition of the filter.

On leaving the filter, the water is neutral, but not resistant to fresh infections and it is therefore dosed with chlorine in a proportion of between 0·2 and 0·5 parts per million, either from a gas cylinder, or with any substance containing free chlorine. Sodium hypochlorite, for instance, may now be produced electrolytically and apparatus suitable for baths is now available.

Authorities differ as to whether aeration should take place before or after filtering, but it seems advisable, when aeration is done before filtering, to have some additional cascade or fountain to give the water extra sparkle.

The water is generally returned to the bath by several inlets at the shallow end, but occasionally there are additional inlets at the deep end, so as to move the water towards the outlet at the deepest point, generally some distance from the deep end of the pool.

For removing sediment from the bottom of the bath, or from settling tanks, several types of suction sweeper are available and these can be used without emptying the bath.

It is essential that the outlets be large enough to prevent any dangers due to suction. Some designers let the water in at the deep end and overflow into the scum gutter at the shallow end in the belief that the dirtier water and floating matter from the crowded shallow end is carried off more rapidly. It is important that care is taken in chlorination to prevent over-dosing, as the result is irritating to the eyes and mucous membranes.

It is impossible to indicate sizes required for the plant rooms for filtration and recirculation, as individual manufacturers' needs vary considerably, as do the actual water contents of baths. The placing of the plant in relation to the pool matters little and is usually dependent on the general layout of the other buildings attached to the scheme. Many open-air baths have their plant placed on approximately the same level as the bath surround, rather than sunk into the ground; the placing is of little importance, as the pumps have to lift the water to bath level in any case. (*See* Figs. 32 *and* 33.)

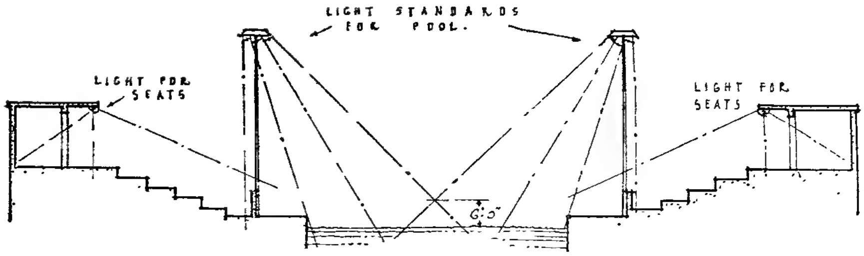



Fig. 30 Artificial lighting

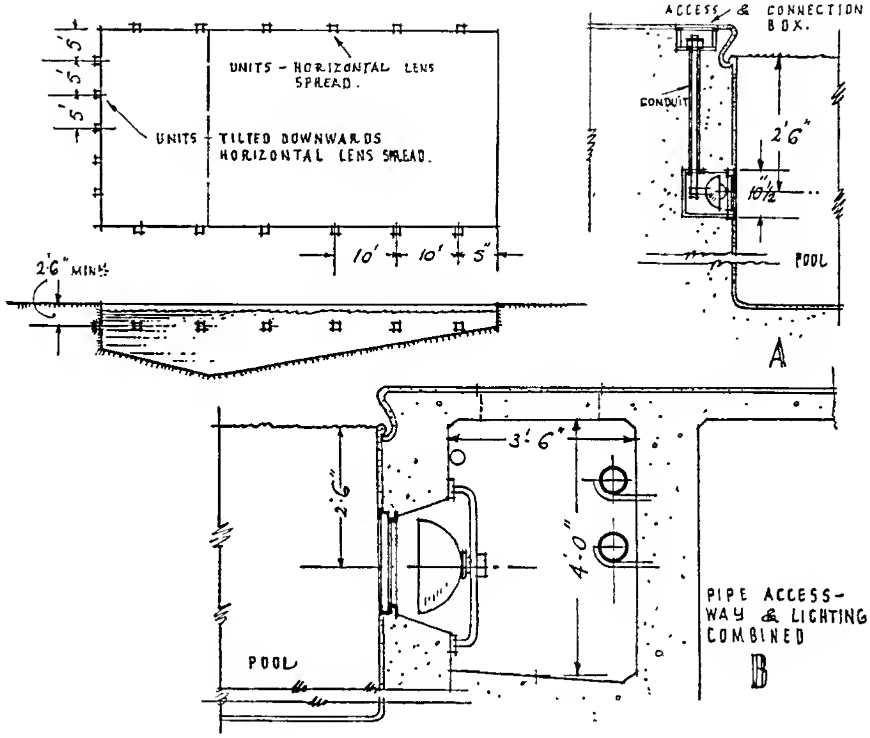



Fig. 31 Under-water lighting

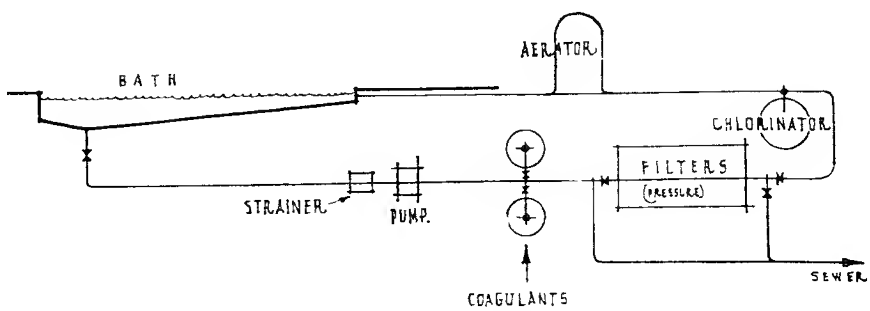



Fig. 32 Diagram of filtration elements

## OPEN-AIR SWIMMING BATHS

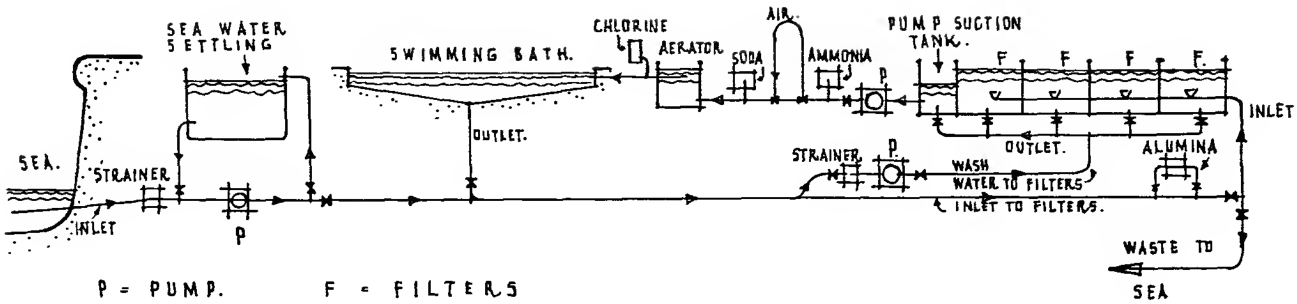



Fig. 33 A sea-water circulation plant

### Warming of Water

In only a few open-air baths schemes is the expense of water heating considered to be economical, owing to the heat losses on cold days and during the night.

If a recirculation system is used, the water may be heated before being returned to the bath, but in other systems the problem is more difficult.

A boiler room is generally needed in all schemes for heating hot water for lavatories, showers, refreshment room and laundry. Heating may be by any of the usual methods, but as the load is very intermittent, automatically controlled gas or electric heating of boilers is specially worthy of consideration.

### Waves

In some continental baths successful experiments have been made for the production of artificial waves and there are now several successful similar installations in this country. The waves are produced by mechanically agitating the water from one end of the bath, usually the deep end, by means of electric motors operating a form of propeller placed behind the end wall with long openings for the water to pass through the pool lining.

One drawback to the use of artificial waves is the greater loss of water into the scum gutters and the necessity for placing them higher above the normal water level. As an attraction, however, they appear to be very popular if operated at intervals, of say, 15 minutes, with similar or longer smooth water periods for normal swimming.

### Laundry

In many districts, laundry facilities are available for washing towels and bathing dresses at other institutions under the same control, but frequently, however, small laundries are attached to the bathing establishments themselves. One large room is generally sufficient to hold the required equipment, which consists only of a washing machine, a hydro-extractor (or a wringer in smaller establishments) and sometimes a small-sized ironing machine as well.

Drying in large schemes is sometimes by means of heated drying-chambers, but very often ordinary open-air drying is adopted. Hot water in considerable quantities is needed for washing to be done satisfactorily, but one plant for all hot water purposes of the whole scheme is generally installed, unless localized gas or electric heating is found to be more economical in each section.

It is often found a convenience if the laundry is placed close to the ticket office if the hiring and issue of the towels, etc., are also carried out at the ticket office.

### Staff Rooms

Staff changing rooms are needed for attendants of each sex with lavatories and W.C.s attached.

In addition, mess rooms should be provided, as well as a store for cleaning utensils and materials, and also an apparatus room, for storage of bath equipment. The latter must be large enough for storage of polo goals and diving-boards, which may be moved from their normal positions for special occasions.

### Refreshments

In most of the large open-air bath schemes catering facilities are provided, while in small establishments a counter for the sale of tea, coffee, soft drinks and confectionery is usually needed. These catering facilities should be available both to bathers and spectators (if any), and special consideration should be paid to the provision of adequate facilities for those in wet costumes who would cause inconvenience if they were allowed to enter the refreshment room. Open terraces in the sunshine, where chairs and tables may be placed, should be provided.

Many cafés attached to baths do not provide a service of waiters or waitresses but rely on " self-service " by patrons from counters or buffets; but where large numbers use the café, service must be provided, and the planning will vary accordingly. Counters for the purchase of drinks and confectionery should in all cases be placed so that bathers with wet costumes may buy what they require without inconveniencing others using the restaurant; especially is this the case where the café is provided with sunbathing terraces or lawns.

In large establishments two buffets and even two sections of the restaurant will be required to accommodate both spectators and bathers at the same time; the latter are sometimes catered for by arranging serving hatches which may open on to a portion of the bathers' terrace or promenade so that they do not enter the café proper at all.

### The Problem

There is an increasing demand for hostels in rural districts to accommodate tourists, especially walkers and cyclists, at minimum prices. Many examples of this type of building exist both on the Continent and in the United States of America; these are run under the auspices of such organizations as the various alpine clubs, touring and walking clubs and cycling societies. In America a number of these buildings have been established in the State reservations and national parks and are run and financed by the governing authorities.

This special type of hostel which is required, is mainly, but not exclusively, intended for walkers and cyclists paying minimum prices for the accommodation. The type of people to be catered for are mainly those not able to afford the cost of hotel accommodation, who wish to travel " light " and " rough," and who are prepared to cater and partially attend to their own wants, with provision of the bare necessities of sleeping and eating facilities, and do not demand any attendance whatsoever from servants, with the possible exception of a limited amount of cooking.

The buildings to meet such a demand are generally only in use at week-ends and during the summer months, and even during the periods of use are only occupied from early evening until after breakfast. Such hostels are under the charge of a resident warden (sometimes a married couple), who looks after the general cleaning, and who will also cook for visitors if this is required.

Hostels should have separate accommodation for both sexes, and rooms for married couples are not usually provided. The essentials which the building and its equipment must give are, first, a bed for which a mattress and blankets are provided, but each visitor brings or hires from the warden sheets or a sheet sleeping bag; secondly, facilities for cooking both by the visitors themselves, and communally by the warden; thirdly, sanitary accommodation, including baths, when the water supply permits; fourthly, a common room in which visitors may spend evenings and eat meals, and lastly a suite of rooms or flat for the warden, who is also, generally, provided with a small office.

### Site Considerations

The site for such a hostel has few special requirements. It should be pleasant, quiet, away from main roads, and be so situated that the prospect is good and the aspect such that the common room may be towards the south, or, better, west, as the use and enjoyment of the room is mainly in the evening. The dormitories or bedrooms are best with an easterly aspect. A large site is usually unnecessary, and may involve upkeep work which the warden could not undertake, and which hostels could not carry, as the intention is primarily accommodation at minimum expenditure. Care should be taken when selecting a site that a water supply will be obtainable either from mains or from wells or other sources which can meet the demands of maximum numbers of visitors during summer, and, consequently, dry months. Public sewers are an advantage, but often not available, and suitable falls and similar facilities should be considered for a sewage disposal system of an adequate capacity. Electricity or gas for lighting and cooking are very advantageous, but are sometimes not available in the most pleasant or desirable districts where this type of hostel is most likely to be appreciated and required. If gas or electricity are not available, oil is often used as general illuminant and for cooking; portable containers of compressed gas have also been found to be convenient and easy to handle.

Heating is necessary in many hostels, particularly those situated in exposed or high districts, while most hostels have an open fireplace, preferably for burning wood, in the common room.

It is desirable that the buildings should be soundly built and well designed, and not of a makeshift character.

Such hostels should not spoil local amenities, nor need they be designed out of sympathy with local surroundings. Local materials should be used where possible, and when this is not possible only those of a suitable character should be substituted. The buildings should be simply designed throughout and should internally be well built of materials which will provide the maximum of cleanliness and hard wear with the minimum of maintenance. The building may well be of a semi-permanent nature so long as it has a reasonably long life without undue upkeep cost.

### Size of Buildings

The total accommodation at any particular hostel is largely dependent on the anticipated number of visitors to each district, but it does not seem desirable that the numbers should exceed figures of 45 to 50 in any one scheme, unless the warden has assistance. The visitors do most of the work themselves, but the general cleaning and supervision is entirely in the hands of the warden, assisted, if he is married, by his wife. The accommodation may be planned on one or two floors.

Types A and B in Fig. 1 are in essence, one-storey buildings with a suite of rooms for the warden on an upper floor, but Type C has two floors in order that the sleeping and sanitary accommodation may be duplicated, each floor being confined to one sex, usually men on the ground floor and women on the first floor.

### General Planning

Fig. 1 illustrates three typical hostel analysis plans providing generally the accommodation previously discussed. Type A is a single-storey building, with only the warden's quarters on the first floor. Type A demands the layout of a building so that the common room should have a westerly aspect, with the entrance at the centre on the east side and the two dormitories on a north and south axis. This layout provides an east aspect for a long side of both dormitories, which is most desirable. Dormitories are best as wings, so that cross ventilation is available, as the accommodation in floor space has to be reduced to the minimum. In this type only one kitchen is shown for the use of both visitors and the warden, although these are generally separate, as some visitors prefer to save the cost of paying for food to be cooked. The common room is placed so that the walls are exposed, although windows are not necessary on the north wall. A terrace is provided on the south of the common room, approached directly from it by a set of casement doors. This plan places the dormitories for each sex, together with the sanitary

accommodation, on each side of the central hall.

Type B is also mainly one-storey, and is based on a site with a different aspect; the entrance is on the north, the common room has only one main wall exposed, and this is towards the south again with a terrace as in Type A. The dormitories are also on each side of the main hall, and turned to take as much advantage of east light as is possible on the site. In this scheme separate drying rooms are provided for the clothes of each sex, and also the sanitary accommodation is approached from a lobby and not directly from the dormitories as in the other two types. If the corridor is introduced as shown, service from the kitchens to the common room creates a cross circulation, but in this type of building the corridor is not strictly necessary, and can be omitted, so that all the rooms lead directly from the common room. The corridor has the one small advantage of cutting off more satisfactorily kitchen smells penetrating to the common room: meals are likely to be cooked during long periods in the evening, as visitors may arrive at all times.

Type C is a two-storey building with the women's dormitory placed over the one for male guests, thus leaving a wing with three open walls for the common room; this arrangement permits a maximum of sunshine in this room, which is used both in early morning and in the evening. Terraces are placed on both south and west frontages of the common room. Both Types B and C are compact plans from the point of view of water and drainage services. In each type similar accommodation is provided for the warden, comprising an office, a sitting-room, a bedroom and the warden's kitchen, which, as already stated, is the general kitchen for the building, and where he or she will cook his or her own food.

### Entrance Hall

This should be large enough to cope with a reasonable number of people arriving together. In exposed positions it is essential to provide a draught lobby. Long seats can be planned on each side of the entrance hall under which to put boot shelves or lockers; visitors are generally required to take off heavy walking-boots before entering the public rooms or dormitories. These shelves or lockers should be provided for at least 90 per cent of the sleeping accommodation: 10in. (width) by 9in. (height) and 14in. (depth) should be allowed per person. Lockers or shelves are better 6in. clear of the floor to aid cleaning.

On at least one side of the hall should be placed a large notice board, about 5ft. long by about 2ft. 6in. high. At one side or at one end there should be a hatch opening into the warden's office. Near the hatch can be arranged show cases in which the warden may display supplies for sale, such as sweets, tobacco, maps and spare equipment. The hatch should be provided with a shelf or counter large enough to allow for signing a visitor's book. Fig. 2 indicates the entrance hall for a medium-sized hostel.

### Warden's Office

This office should adjoin the entrance hall and be accessible from the warden's kitchen. The room should have sufficient space for a desk, a table for meals and at least two chairs, together with ample cupboard space for the storage of supplies and files, etc.

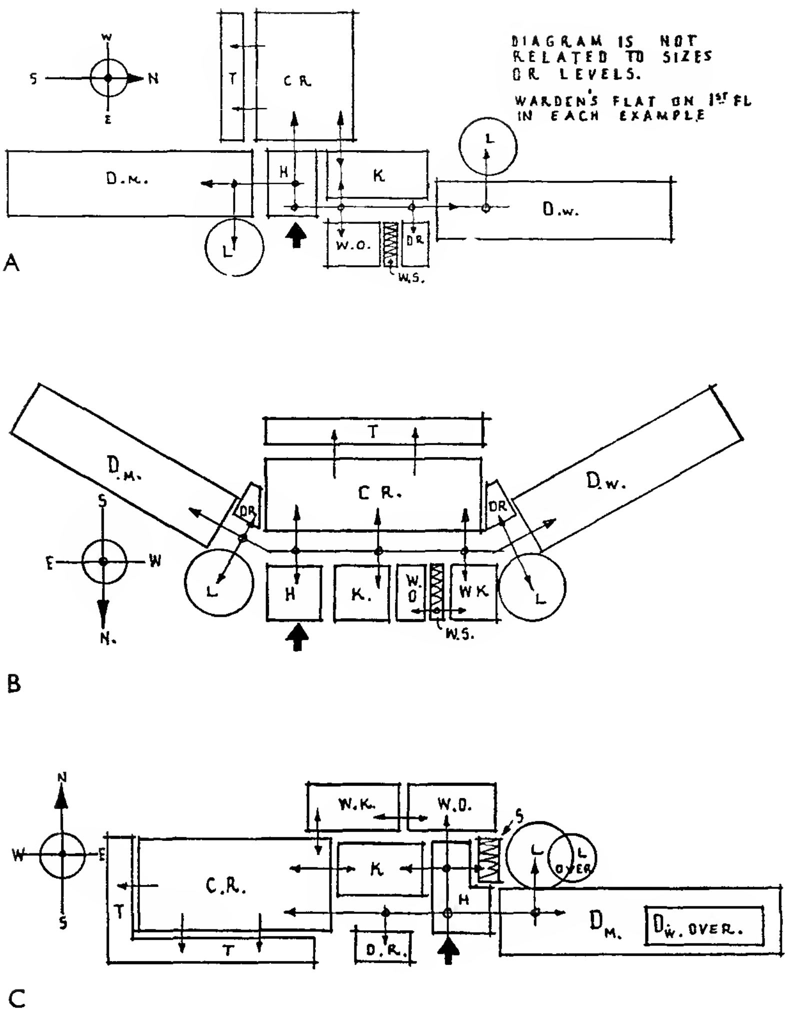
### Common Room

This room is usually the only sitting-room provided, and therefore serves visitors of both sexes for meals, for writing, and as a general lounge. A floor area of at least 10sq. ft. per person, based on the maximum bed accommodation, is usual. The room should be rectangular rather than square with a fireplace, if possible, on a short side away from the room door and any doors to kitchens. Some windows are best in the form of casement doors leading to a terrace or garden, which may be used both for sitting and for open-air meals. Some cross ventilation is desirable. Heating other than an open fire is considered by some to be unnecessary, as these hostels are not likely to be extensively used in winter time; but in some districts many visitors may stay during spring and autumn, when heating is desirable, and assists in keeping the building dry and fit for the immediate use of unexpected guests. The planning of the room should, to some extent, permit of setting aside parts of the room for meals, and also for the fireside area for sitting, while still leaving uninterrupted passageways to the terrace from the room entrance doors from the main hall. The plan shown in Fig. 3 A shows a scheme in which the room is divided in two definite parts, one end for meals with the doors to the members' and warden's kitchen adjoining, and the other end with the fireplace usable as a sitting space; the main circulation from the hall to the terrace thus does not impede either use of the room. Fig. 3 B shows a scheme with a cross corridor, connecting the hall to other rooms, cut off from the rooms by piers and, if required, curtains or screens; the room is again divided into two main parts, but access to the kitchens from the tables necessitates crossing the through circulation, which in rush times may be a disadvantage. As the rooms are large and likely to be occupied by many persons at one time, they are better if the ceiling height is raised above a minimum of 8ft., which may often be achieved by carrying up the room into the roof space, if this part of the building is planned as a single story.

The furnishing and decoration should be plain, simple and strong. Some fixed wall seats for use with dining tables or adjoining the fireplace assist in saving space, but other fixed furniture should be avoided in the common room, as this may often be cleared for games, dancing and other amusements. The general aim of the designer should be to produce a scheme which is pleasant, cheerful, easily cleaned and will stand fairly heavy wear and tear. Natural untreated wood should be considered for finishes and furniture, as this will withstand hard wear and can be washed and scrubbed with the minimum of labour. A certain amount of wall space, which may be provided in the common room, should be allowed for the display of district maps; these may well form permanent wall decorations, or may be arranged on rollers.

### Kitchens

Meals may be provided in either of two ways; firstly, by the warden supplying and cooking all food, and secondly by the members bringing food with them, or purchasing it from the warden and cooking it themselves. All work



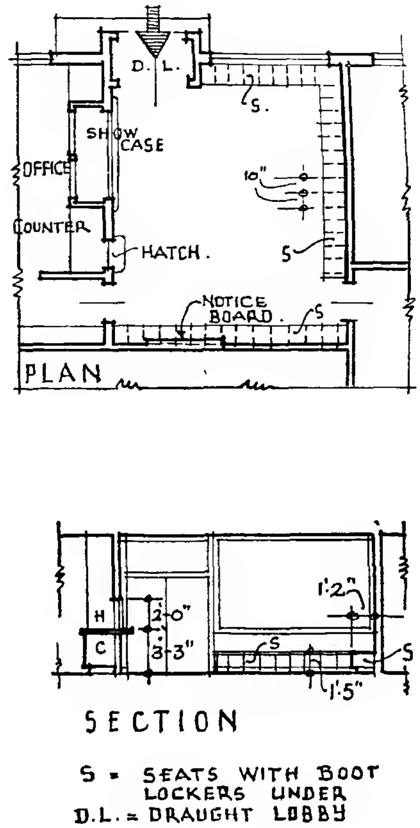




Fig. 2 Entrance hall

Fig. 1 Plan analyses

**KEY**

C.R.—common room
D—dormitories (M—men, W—women)
H—hall (entrance)
W.O.—warden's office
W.S.—warden's stairs
L—lavatories, W.C.s and baths
K—kitchen (communal)
W.K.—warden's kitchen
D.R.—drying room
T—terrace
S—general stairs

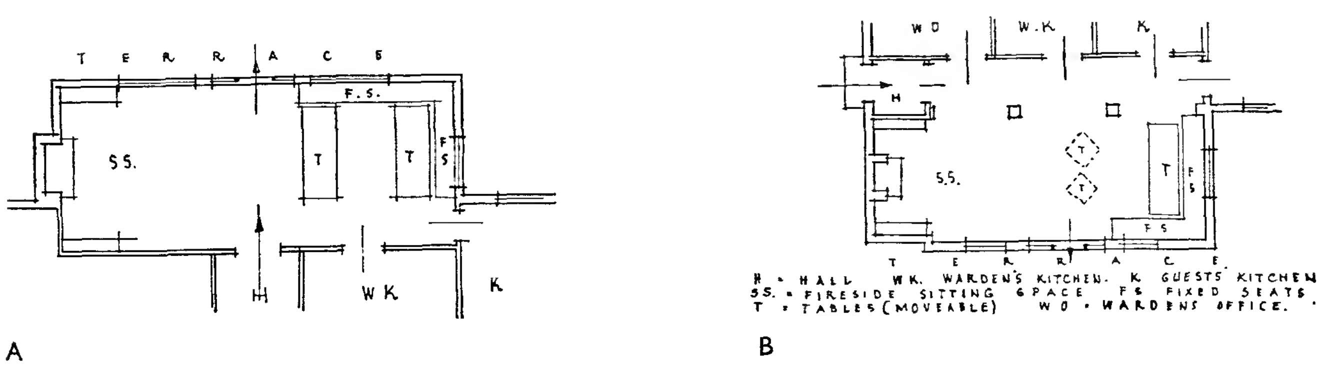



Fig. 3 Common rooms

such as service, washing up dirty china, etc., is usually carried out by the visitors. It is therefore general to have two kitchens in each building, in order that guests may work apart from the warden.

### Members' Kitchen

The main requirement of this room is the provision of sufficient apparatus for cooking, washing up, and also storage for utensils, cutlery and china for the maximum capacity of the hostel. The cooking required is usually of a very simple nature and consequently many hostels provide only boiling rings; it is preferable, however, to install small table-cookers, either gas, electric, or oil-fuelled, providing a grill for toast, chops, etc., and boiling rings above for the remainder of the cooking. If these small cookers are planned well apart, at, say, 4ft. from centre to centre, and placed on a long continuous table, the space between is then sufficient for the needs of food preparation; this table top should be about 3ft. above the floor level, and may be continued round the room to form draining boards to the sinks and extra table area for utensils and preparation. Below the table tops should be drawers for cutlery, spoons and forks, and cupboards for the larger utensils. Spaces between the cupboards and beneath the table tops are useful when users are standing up to the tables for working, and also for the placing of garbage pails. As many other cupboards as can be accommodated comfortably are needed for storage of china, glass and other essential equipment for cooking and eating. Fig. 4 illustrates a typical layout of a members' kitchen in plan and elevation, showing the main points of arrangement of fittings and cupboards. Cookers should be provided on a basis of at least one for every 8 beds, and sinks in the proportion of one to every 16 beds of the total capacity of the hostel. The cookers and sinks should each be grouped together to reduce the costs of services such as supply pipes and drainage, but each fitting must allow sufficient working space around it. Direct access to the common room is usual, but as meals may be served over a long period, every effort must be made to provide good ventilation in such a manner that the heat and smell does not make the common room uncomfortable. The area of the members' kitchen can be based on an allowance of about 4sq. ft. per person of the total accommodation, as not all visitors cook their own meals, and all meals are not taken at one time; also it can be reckoned that one person is often likely to do the actual cooking for two or more guests. In the members' kitchen, or better in an adjoining space, storage space for members' own food supplies must be provided by shelf space in open-locker form, 12in. wide, 8in. deep, and 12in. high in a cool and well-ventilated position. Shelves should be kept clear of the walls to permit free movement of air. These lockers are needed at the rate of one per three beds.

### Warden's Kitchen

This room should adjoin the members' kitchen, as it has to serve the same part of the common room, and close proximity helps the distribution of services. An area approximately the same as, or rather larger than that allowed for the members' kitchen is needed, as the cooking is likely to be more elaborate and for larger numbers at any one time. Again plenty of storage space is necessary, together with a fairly large larder, particularly in districts where shops do not deliver frequently, and proportionately larger food stocks must be held. A large cooker, often of a solid-fuel heat-storage type, is required, a large sink with good draining boards, space for table, and when suitable power or fuel is available a refrigerator is extremely useful, due to the difficulty of assessing the number of visitors likely to stay on any particular night. It is a convenience for the warden if the boiler room supplying heating and hot water, and the fuel stores, are both accessible from the warden's kitchen without his having to go into the open air. A tradesmen's entrance directly to this kitchen avoids taking deliveries through the building to larders or stores.

### Sleeping Accommodation

It is general to provide this in the form of dormitories in order to reduce the necessary area required to a minimum. It is advantageous to divide the total number of beds between four dormitories, normally one large and one small for each sex, as this allows rearrangements to suit occasions when the demand for accommodation for one sex greatly exceeds that for the other. Thus three dormitories may be used for one sex and only one for the other; when such a scheme is adopted it is important that each dormitory has its separate sanitary arrangements attached. In some hostels, especially on the continent, a few small rooms are provided for married couples; these compartments are equipped with two single beds that can, if necessary, be used for other visitors; complications do not, therefore, arise from the need to provide and to store equipment for double beds. In larger schemes, two-tier bunks may be used instead of beds, thus halving the floor area required for any given number of persons. Beds should be based on the use of standard spring mattresses 6ft. 6in. long by 2ft. 6in. or 2ft. 9in. wide, supported on wooden or metal framing. Spaces between bunks should be at least 3ft. 6in. and preferably about 5ft., as this has to serve four persons for dressing, etc., and, therefore, a good spacing of four bed units is 10ft. or 11ft. from walls to centre of partitions or from centre to centre of partitions. The central corridor-way need not be more than 4ft., but should not be less than 3ft. 6in., thus giving a total internal width for the dormitory of about 17ft. if beds are placed on two sides, forming units for eight beds of 17ft. by 10ft. or 11ft. A window should be placed between the pairs of bunks to ensure adequate ventilation. Partitions between the bed units are best carried up to the ceiling. Dormitories should be at least 8ft. high and preferably slightly more, otherwise the upper bunk is very near the ceiling and the cubic air content per bunk is unsatisfactory. The windows should be as wide as the bed spacing will permit and should extend to the ceiling to be sure of free air for the occupants of top bunks. The partitions between two bunks may be formed of plywood or building board, but this should be reasonably strong to stand up to rough usage and involve a minimum of upkeep; thicker partitions tend to localize noise, an important matter in dormitories. In addition to the actual beds or bunks, very little furniture is required and what is necessary can be incorporated in built-in fittings. A small locker is

desirable for each person and these may be provided satisfactorily between the bunk heads under the window-sill level in sets of two or four as necessary; the guests usually have very little baggage, all of which is carried in a rucksack, and therefore the locker size is governed by providing sufficient space for a rucksack and its contents. Other than the lockers, the only necessary fittings are one or two clothes pegs per person, which may be attached to the bunk ends. Fig. 5 illustrates a typical layout in plan and section of the bunks, from which it should be noted that the lowest bunk is kept about 1ft. 3in. from the floor. Some provision should be made for access to upper bunks when used by women. The dimensions given allow an area of 93½sq. ft. for four bunks, which seems to be very inadequate for health reasons, especially if the ceiling level allows a height of only 8ft. 6in., as the volume is only slightly more than 200cu. ft. per person, which may be increased by partial use of spaces in pitched roofs. Increased dimensions are, therefore, desirable, since there is a likelihood of persons spending complete holidays, sleeping at various hostels based on similar dimensions. It should also be noted that a door is provided at the end of the main passageway as an emergency escape.

As an alternative to the open or semi-open dormitory type of sleeping accommodation, cubicles may be provided; these are formed by dividing the dormitory space either by fixed partitions, curtains or a combination of the two as shown on Fig. 6. Such cubicles are usually planned either for single beds or for two bunks; this type of accommodation is likely to be preferred by women visitors owing to increased privacy. Partitions need only be 7ft. high, thus assisting the through ventilation; the end curtains, being at the same height, also assist cross ventilation. The dimensions may be reduced, if each cubicle is to accommodate one person only, to 5ft. 6in. by 6ft. 6in. with a centre passage only 3ft. wide. The end curtains may be hung on rods between the fixed partitions which should also serve to strengthen the latter laterally.

### Sanitary Accommodation

This should be provided in groups, attached to each dormitory. Direct

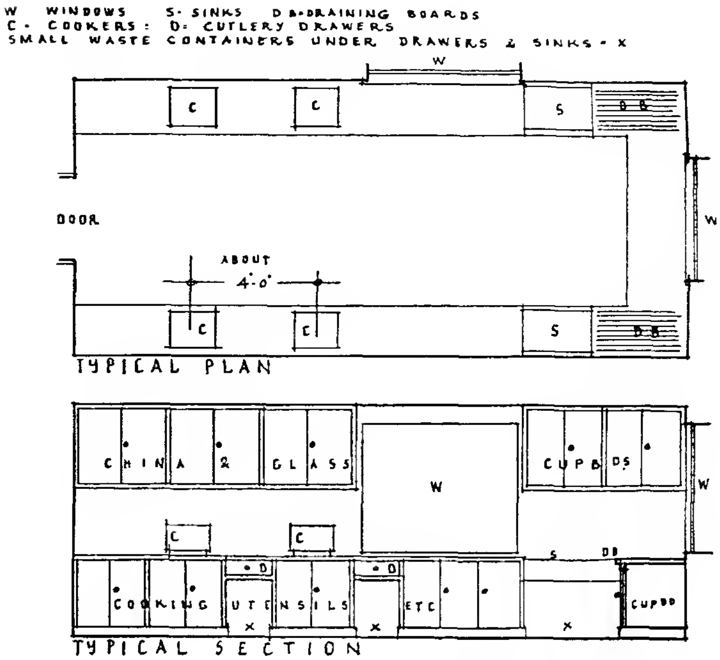
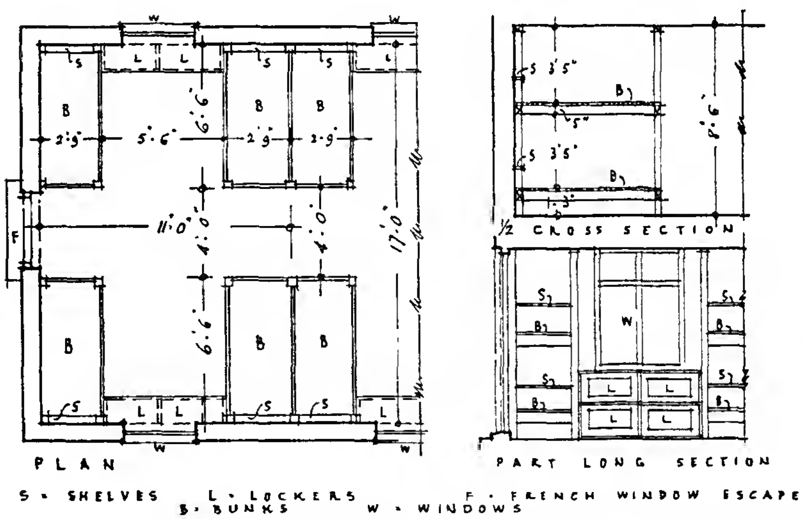
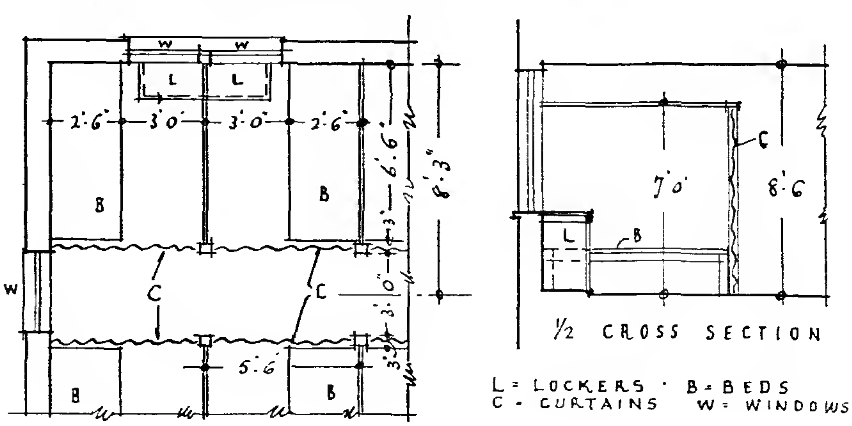



Fig. 4 Members' kitchen




Above: Fig. 5 Dormitories with bunk beds

Below: Fig. 6 Cubicle dormitories



access to lavatories is desirable from the sleeping quarters, but W.C.s should be adequately cut off as they may be used by comparatively large numbers of persons. W.C.s should be provided at the rate of at least one to eight persons with a minimum of two; and lavatory basins at the rate of one to six persons. A larger proportion of sanitary equipment is more satisfactory. Baths should be provided, when an adequate water supply is available, in the proportion of one to eight or ten persons. Shower baths, occupy, with dressing space, less area than ordinary baths; women, however, generally dislike showers. Shower baths are occupied for shorter periods per person and, therefore, may be used by a larger number of persons in a given time. A proper hot-water supply should be provided to all lavatory basins unless water is exceptionally scarce.

**Drying Room**

It is important that provision be made for drying visitors' clothes, as these are often very wet after a day's walking and have to be dry for the next day. The room should be equipped with heating pipes above which clothes may be hung on hooks and hangers. Good ventilation is important for this room, so that the vapour formed may be removed and consequently the room should be on an external wall, and have, if possible, cross ventilation. A floor area of about one square foot per person should be allowed.

**Warden's Accommodation**

In addition to the Warden's office and kitchen it is necessary to provide a sitting room, a double bedroom and a bathroom which are probably best arranged as a flat on the first floor which permits of complete separation from the public rooms and dormitories. The rooms do not need to be large as frequently the warden may be a single person, but they must provide pleasant, comfortable accommodation, as it is the warden's permanent home and not occasionally occupied by passing visitors like the remainder of the building.

**Storage**

It is essential to provide a room for storing spare equipment; as much of the equipment consists of bedding, it must be kept dry and aired; at least a part of such storage should be heated. Easy access for large articles, such as mattresses is important. Storage is also needed for consumable supplies, spare hardware and garden tools.

**Bicycles**

Hostels being much used by cyclists as well as pedestrians, it is essential to provide proper cycle accommodation. It should be covered and preferably enclosed—particularly in exposed districts. The amount of space needed can usually be fairly well assessed, dependent as it is on the nature of the site and the type of hostel. Storage racking requires 2ft. run per cycle if all are at one level, or 12in. run (centre to centre) if two levels are used (*see* section on " Schools "). Some of the racks should be designed to house tandem bicycles; these cannot be parked in the two-level type of rack and, as they are approximately 7ft. 6in. long, they may require greater roof spans than for ordinary bicycles.

**Services**

It is desirable that common rooms be properly heated; especially as many hostels are used, at least at week-ends, throughout the year. It has been customary to heat common rooms by means of open fires, but it would seem worth installing a central-heating system if a hostel is much used during the winter months.

An adequate supply of hot water in both the members' and wardens' kitchens is essential, together with hot water for baths and basins.

**Garage**

As the hostels of the types referred to in this section are not intended for motorists and are thus generally not planned to accommodate them, it is only necessary to plan for a single garage for the warden's car, a necessity when the hostel is far distant from the nearest town.

**Layout of Site**

Hostels need not have much surrounding land, unless camping facilities are also provided. The warden is usually too busy to do more than keep the land tidy and to grow a few vegetables; the visitors do not stay long and cannot or are unwilling to do gardening. It is important, therefore, that all layout be simple, with, in suitable locations, grass areas and with only a few flower beds.

**Camping**

Some hostels provide camping sites for visitors bringing their own tents. Visitors of this kind do not affect greatly the planning of the hostel buildings; there should, however, be a proportionate increase in sanitary accommodation and possibly a slight increase in cooking facilities, though most campers may be expected to bring their own cooking equipment.

### Introduction

It is certain that the future will see a steady growth of communal holiday institutions of various types. Among these are youth hostels, which may be considered as catering in a specialized way for the walking or cycling tourist, and the holiday camps, which have developed at many coastal places for the purpose of providing accommodation for visitors over periods of one to three or four weeks. The holiday camp has, up to this moment, provided for seaside summer holidays, and its growth has increased mainly by reason of the numerous facilities provided within an inclusive charge, and because food, housing and service are more satisfactory, and in many instances less costly than in normal "rooms" or "apartments" in seaside towns. As the camps are organized for large numbers many communal facilities, such as cafés, lounges, dance and games rooms, swimming baths and bathing beach huts are rendered economical, and the costs of operation are almost always included in the weekly charges for housing and food.

The increase of this type of establishment is likely to continue, on account of the extension of the principle of paid holidays for all workers, which is gradually coming into being. There are, also, signs of a movement to set up such camps aided or supported by local authorities or by other bodies interested in national fitness, so that the dwellers in the more crowded parts of our industrial towns may be enabled to go to seaside or country at nominal rates; various private, semi-public and charitable bodies are assisting in the development of such movements in order to provide holidays at very low costs.

The type of housing, furnishings, service and amount of amusements must vary according to the proposed weekly charges and different price grades are necessary in separate camps to cater for the needs of different sections of the community.

Accommodation in each grade must provide for families of various sizes, and also for single men and women who find that the holiday camp provides a communal life quite unavailable in lodgings.

One of the most important factors is the inclusion of as much of the holiday costs as possible in the one primary charge; thus the avoidance of "extras," which are often the cause of much irritation to holiday-makers, is attained, although some camps charge extra for such services as baths, early morning tea and even afternoon tea.

The extent of the amusements provided free must again be limited by the price paid, but by the centralized organization of large camps, economies do, in fact, usually permit of increased facilities.

In most camps visitors are expected to keep their sleeping rooms tidy, make beds, etc., but in others all the work is done for the visitors by the staff as in an hotel; the main cleaning is mostly carried out by the camp staff on Saturdays between lettings.

Most camps provide some shopping facilities for their guests, so that tobacco, sweets, postcards, etc., may be bought without leaving the camp; in some examples quite elaborate shops offer a wide range of goods, and incidentally assist the profits of the undertaking or the reduction of general charges.

Some of the camps have also additional amusement facilities available at extra charges.

### By-laws, etc.

Buildings for holiday camps are controlled by the normal building by-laws and by the Town and Country Planning Acts. In addition, certain parts of the Public Health Acts and Model By-laws make special reference to "Tents, Vans, Sheds and Similar Structures" which may be presumed to control at least some of the buildings of the nature under consideration in this section; the more important references are to provision of proper and adequate sanitation, water supply and refuse disposal. Certain direct references are made to movable dwellings and camping grounds which involve licensing by local authorities. There is also a reference to the conduct of camps, to litter, and to noise and musical instruments.

Such regulations, or implied regulations, may be considered as applying to holiday camps expressly designed and built for the purpose, whether they take the form of permanent, or semi-permanent buildings, or of temporary buildings.

### Licences

A normal licence for the sale of alcoholic liquor cannot as a rule be obtained for a holiday camp, although certain similar buildings (when called hotels) have been granted licence. The grant of a licence necessitates serving to all, other than members of the camp, and this may not be desired. Some camps prefer to be without a licence of any sort, while others make their visitors members of a camp club and obtain thereby a club licence, a scheme which eliminates many difficulties from the management point of view.

### Situation of Sites

Up to the present holiday camps appear to have been organized only at the seaside, but there seems to be no reason why similar camps should not be planned in such places as the Lake District, the moors and mountains, or in the vicinity of other natural attractions. There does, however, appear to be a possibility that similar camps, which are, in fact, moderate priced hotels, might be placed nearer to the larger towns; for instance, in the London Green Belt, for use at week-ends all the year round, and for longer holidays for those who cannot afford long journeys. It would seem that in such situations most of the facilities of the seaside camps are available, such as clean fresh air, semi-open-air life, games facilities and rambles with the one exception, of course, of the seashore and sea-bathing; these may to some extent be replaced by sand-pits and a swimming-pool.

### Sites

Certain matters in regard to the relation of sites should be borne in mind; level sites reduce the cost of formation of tennis courts and other recreation grounds, but small variations can be handled easily when a plan is based on a number of separate buildings. Aspect should have careful consideration in planning both the communal and sleeping rooms, but in resort situations, such as at the seaside, prospect may be deemed of greater importance than aspect, particularly as the buildings are used most in the

summer time and much of the visitors' time is likely to be spent in the open air. Sites with water and electricity available are to be preferred—except when the scheme is large enough to warrant the cost of sinking wells and generating power. Drainage should be considered very carefully; sewage has to be disposed of quickly and easily and, if a public system is not available, additional and suitable land is necessary for sewage disposal. Small camps may be equipped with earth or chemical closets, bearing in mind by-laws in regard to distances from wells, cleansing, approaches, etc. But for larger schemes disposal systems with septic tanks or with complete rotary distributor systems are needed; these systems involve the allocation of an adequate area of site, which should be well separated and screened from the camp by means of walls, close fences, trees or hedges. Proximity to towns or villages is not important if adequate transport is available, or if it can be provided by arrangement; with larger schemes, in fact, some advantage may accrue from being distant from towns or villages, since the amusements and shopping facilities provided by the camp owners are better patronized and thus justify capital expenditure.

As already mentioned, there seems little reason why holiday camps should be confined to seaside districts; although they may be self-contained as far as recreation is concerned, it does seem desirable that there should be natural attractions, such as woods, lakes, rivers or mountains, around the site chosen. Since there is likely to be a continuing increase in the use of motor vehicles, holiday camp sites should have reasonably good road approaches, which are also important for delivery vehicles and coaches bringing visitors or taking the latter for local excursions.

**Sizes of Schemes**

The sizes of holiday camp schemes vary considerably; some provide for 30 to 50 persons, whereas others may cater for several thousands. In the smaller types the individual or family sleeping accommodation is likely to be substantially the same as that needed for large camps, but the communal provisions, in the form of public rooms and open-air facilities, are likely to be very different. Small camps may have one general public room used for meals and recreation; the larger camps will need separate dining-rooms and several lounges and games rooms, in addition to shops and licensed club rooms. Such extensive camps will certainly need garage accommodation, with a repair shop, petrol pumps, etc.

Some camps have been built in the vicinity of existing buildings, such as country houses and farms. In these cases the existing buildings have generally been used as part of the administration, staff or communal accommodation, with new sleeping accommodation, often in tents in the first instance and, ultimately, in "chalets," or cabins, added.

**General Analysis**

The camp scheme should be considered in two main groups, first, the accommodation which has to be roofed and protected from the weather, such as the communal rooms and sleeping accommodation; secondly, the accommodation, mainly recreational, which is provided in the open air.

The first group has certain main subdivisions, which are: general rooms, such as lounges, games rooms, club rooms; rooms for food preparation and service; guests' sleeping accommodation, together with sanitary and bath units; staff accommodation; and, lastly, administration rooms. Garages, or more often open-air car parks, are provided in some camps, while others find there is little demand for this provision except for staff purposes.

The essential grouping keeps all general rooms together and to these should lead the main approaches from the road, gardens and beach, if any. Near the main road-entrance should be placed the rooms needed for administration, the number and size of which will vary mainly with the size of the camp. In smaller schemes the shop should be attached to the offices, but this may not always be desirable. All rooms where food service is needed, such as dining-rooms, lounges where teas may be served, club rooms and bars, must be grouped with the kitchens. Sleeping accommodation should be isolated away from noisy public rooms as much as possible, and the main bathroom and lavatory accommodation attached to the sleeping units, although some lavatory facilities should be grouped with public rooms. (*See* Fig. 7.)

**Layout Types**

Many different types of layout have been used for holiday camps. The communal accommodation in all types is assembled in central blocks, around which the sleeping units are grouped. The sleeping accommodation may take the form of pavilions, blocks of buildings containing many bedrooms, suites of bedrooms, or "chalets" or huts, separate or in small groups. Fig. 8 illustrates two typical layout plans based on the use of large blocks or pavilions for bedrooms. These pavilions may be single-storey buildings, or two or even more floors high and they may be single- or double-sided (rooms back to back); in the latter type it is almost essential that the main axis of the blocks should be from north to south, as rooms facing due north are undesirable. As already suggested, north aspect may have to be considered not necessarily as the direction away from the sea or other view, but when prospect is thought to be of greater importance than aspect.

A large area of site adjacent to the main building should be kept open and available as a recreation space as indicated on Figs. 8 and 9. If a pavilion-type layout is adopted, the distance of blocks from one another must be controlled by the height of the building. In all cases an adequate amount of garden between blocks not only adds to the appearance, but also increases privacy, especially when balconies or covered porches attached to adjoining blocks face one another. By continuity of balconies or covered porches on a pavilion type scheme, together with connecting covered ways, as indicated in Fig. 8, a limited amount of protection may be given to guests in wet weather; protection of this type is very difficult to provide in the detached chalet type of plan shown in Fig. 9.

The advantages of covered connections giving access to sanitary accommodation are particularly worthy of careful consideration; at the same time it may be borne in mind that the covered connecting ways which pass close to each sleeping room reduce privacy; but these covered ways are not likely to be used a great deal in fine weather.

When pavilion blocks are grouped round gardens or tennis courts, as suggested in Diagram B of Fig. 8, cer-

tain rooms obtain direct views of the sea—if this is on the lower side (south) of the diagram—but in Diagram A no direct view is provided.

Fig. 9 illustrates two typical layouts where huts or chalets are used. Type A is less monotonous than Type B, and has a greater feeling of spaciousness. These huts may be single-room units or blocks of rooms back to back and two or more to each frontage.

The pavilion-type plans appear to give a much more pleasant layout and better general architectural appearance, but if they are taken to two or three stories stronger construction is involved, and more soundproof construction must be provided if there is to be the same amount of privacy as is obtained in a plan using the individual hut or chalet accommodation.

### Reception

Visitors to holiday camps arrive both by railway and by road. At the busy season all letting periods are based on a week commencing on Saturday afternoon and finishing on the following Saturday morning. In many camps arrival must be after a fixed time such as 4 or 5 p.m., and in certain instances special trains are organized to run from centres of population to arrive about 5 p.m. Similarly camps often desire guests to vacate rooms not later than 10 a.m. on the day of departure in order to leave as much time as possible for the staff to clean rooms between each letting. In consequence of the fixed arrival times and special train schedules, a large proportion of new visitors have to be dealt with at the reception office in a very short period of time.

At the reception office, on arrival, guests will have their sleeping accommodation allotted to them. They usually will have to pay the week's charges in advance, and they will be issued with club badges and general information. Camp authorities usually ask for a deposit when the booking for accommodation is made, and the balance is payable on arrival at the camp. In most camps club badges are given to all visitors in order that they may use and be served in the rooms having a club licence.

A number of guests, and in fact an increasing number, arrive in cars, for which accommodation must be provided. Certain of the existing camps

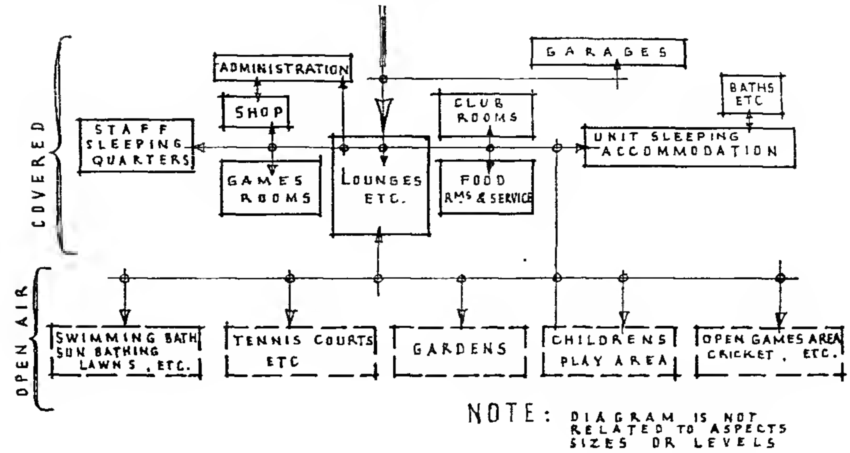



Fig. 7 Main entrances

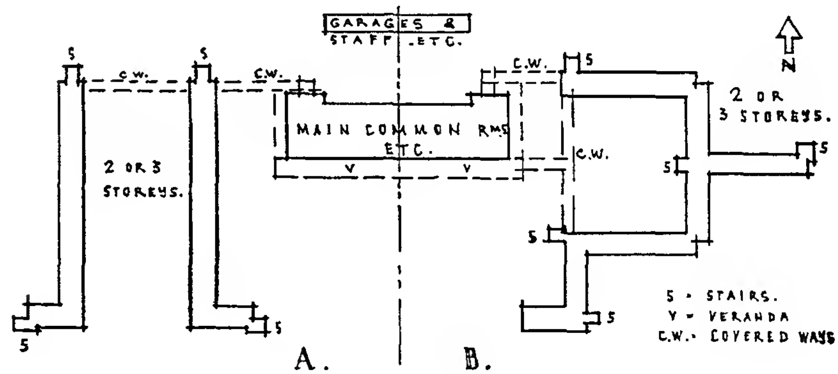



Fig. 8 Two typical pavilion layouts

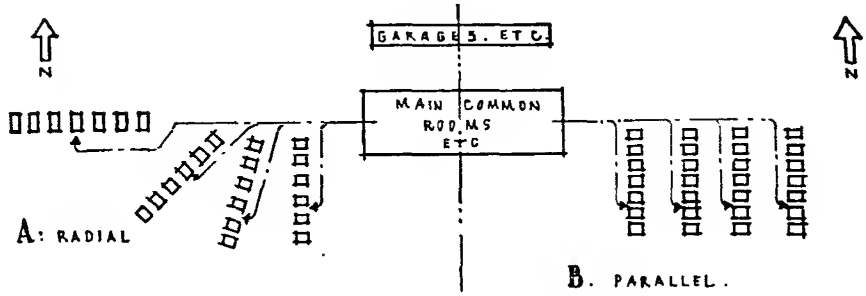



Fig. 9 Two typical " chalet " layouts

have found that sleeping accommodation for 1,000 guests may require motor-car space for as many as 200 cars; the more expensive the camp the greater is likely to be the proportion of private vehicles. Some covered car-parking space should be provided, for which a charge may be made, and it may be found that a few visitors will like and, are prepared to pay for, lock-up garages. If camps are in very exposed positions and are likely to be open to receive visitors in the early spring or late autumn, more covered and partially enclosed space is necessary than for those camps open only in the midsummer months. Covered space is desirable for 10 per cent to 25 per cent of the motor-car accommodation—according to the class of visitor catered for at any particular camp. (For detailed planning of garages and car parks, *see* section on "Garages and Parking Spaces.")

Car parks and garages should not be planned in a position where their use is disturbing to any sleeping accommodation and, in addition, should occupy a position where the entrances and exits are capable of control. Larger camps will justify the installation of petrol pumps, and even a small garage building for sale of smaller accessories and for carrying out minor repairs; these may be operated by the camp management or may be let on a lease to other management.

Fig. 10 illustrates the general planning of a main entrance and approaches to a larger type of camp. The reception buildings which incorporate the management offices of the camp may be a separate building or may form part of the main communal building of the camp. In the figure the reception unit is set back from the main road to allow vehicles to drive up to the doors to set down passengers and luggage; also to allow vehicles such as charabancs to wait to pick up visitors without obstructing the main road. It should be noted that space for pedestrian approach is provided separately from the vehicles; this leads directly into the camp—and may form a main axis—but passes the reception building so that the latter exercises some control over all persons entering or leaving the site. Car parking and garage space is kept to one side of the main vehicular entrance and exit so that these need not be obstructed, and the petrol pumps and service building are placed away from all other buildings but on the route of all traffic leaving the parking space on its way to the main road.

The reception office itself should be long and fairly generous in area to accommodate the very large numbers who arrive in a short space of time. Long counters are essential and there must be adequate space for luggage as well as for the guests themselves. One or more offices are needed in conjunction with the reception office. The equipment of the reception office is largely a matter of the individual needs of each management. Some camps use the same building as the shop for the sale of various goods to visitors and some use it for the display and distribution of letters, the sale of photographs and similar purposes, but other camps restrict the use of the room or building to management of bookings, cashier, etc., only.

Fig. 11 illustrates in diagrammatic form the essential detail requirements of the reception offices for a large camp. There are several entrances from the main approach to the camp. These lead into a long room with a full-length counter which may be divided into sections for clerks dealing with reservations of various groups of guests, for cashiers, general information, etc., as considered necessary. The public space then leads directly to the camp, by separate doors to avoid cross traffic. Luggage is usually handled by the guests themselves, but in some camps the staff assists guests with luggage and shows them to their sleeping accommodation. In the scheme shown in Fig. 11 various management offices are provided behind the main counter, with the manager's office arranged centrally for easy and rapid access to all rooms as well as to the public counter itself. The sizes needed for these rooms are entirely dependent on the numbers to be accommodated in the camp, although in some schemes there mav be central management offices elsewhere, controlling a number of camps, where much of the general control and buying takes place: these reduce the accommodation needed at the camp itself.

Fig. 11 also shows direct access from the camp through a waiting room to the manager's office, and a waiting room attached to the public space. In this example the shops are adjacent to the management rooms and are placed each side of the main public circulation space to the camp. Large camps need considerable space for shops and kiosks; these may be operated by the management or, alternatively, sub-let. Storage for stock is essential for the shops as is storage space for files, stationery and literature for the offices. Fig. 11 also shows a safe or small strong-room, without external walls, attached to the accounts or cashier's room. It should be borne in mind that large sums of money may have to be kept on the premises from Saturday until Monday, and that there are also daily takings from general sales, bars and lounges for which a safe may be required.

### Dining-rooms

It is essential that dining-rooms for holiday camps should have an area sufficient to seat the maximum number of visitors which the camp can accommodate at one time, as having two services for meals appears to be very unpopular. The floor area should be based on an allowance of at least 10sq. ft. for each person up to the maximum numbcr; this permits of more generous spacing at times other than peak periods such as the month of August. Separate tables for each party are preferred in all but the cheapest types of camps. Consequently it is wisest to arrange a layout based on tables for two persons, which may be put together to form units for parties of any size; some camps, however, prefer to use tables for four persons as a minimum number. Full information and table spacing diagrams for dining-rooms and restaurants are given in the section on "Hotels"; this information applies equally to the present subject. Tables for two persons should be 2ft. 6in. by 2ft. 4in. as a minimum, which may be taken as the basic unit for table layouts. As stated in various other sections of this book, rooms requiring food service should be rectangular on plan, with the service rooms placed along one long side, thus reducing the distance of the tables furthest from the service room to a minimum.

Spans of dining-rooms should be as large as possible, in order to avoid supports obstructing the floor area; if spans are fairly large, light should be provided from roof lights or clerestory windows for the parts of the room away from the outside walls, as the

# Holiday Hostels and Camps

## HOLIDAY CAMPS

constant use of artificial light is costly in buildings of this character.

Direct top light is better avoided, as in summer time the cumulative heat in the room due to the direct rays of the sun is likely to be uncomfortable; clerestory and similar high side-lighting is much more satisfactory, as the direct sunlight entering the room is limited; windows may be made to open more easily than top lights, thus providing ventilation to the rooms at a high level near the centre of the floor space. Fig. 12 illustrates four typical cross-sections suitable for the large spans necessary for dining-rooms, together with methods of lighting and insulation against heat. Diagram A is based on a large clear span for the whole width of the room and on the use of a Belfast or similar truss. A flat ceiling is provided over the whole area of the dining-room; high side light from windows over the veranda on the one side, and over the kitchen and service rooms on the other, permits of fairly good light distribution over the whole floor area.

Diagram B also has a clear floor area, but the trusses cut through the ceiling, which, since two rows of high-level windows are provided, is at two levels.

In Diagram C part of the room only has a high ceiling level, and the remainder a lower level similar to that of surrounding verandas and rooms; this type necessitates a certain number of supporting piers or stanchions placed in the room.

Diagram D shows a further type of clear span roof with a flat ceiling over the whole area of the room. This type has large windows, occupying the full height of the room, and provided by the omission of the covered veranda on one side. These windows permit much more direct sunlight to enter the room, but this may be considered a disadvantage by some people; the room in midsummer may be too hot.

The outside walls of the room should be given as much glass area as possible. Visitors in holiday camps will usually enter the dining-room directly from the gardens—which probably provide the nearest approach from the sleeping and games accommodation—so that a large number of doorways is desirable; in most camps there is a rush to meals the moment they are announced, and unless there are numerous entrances to the dining-room, congestion becomes acute. Doors are best in the form of wide pairs opening outwards;

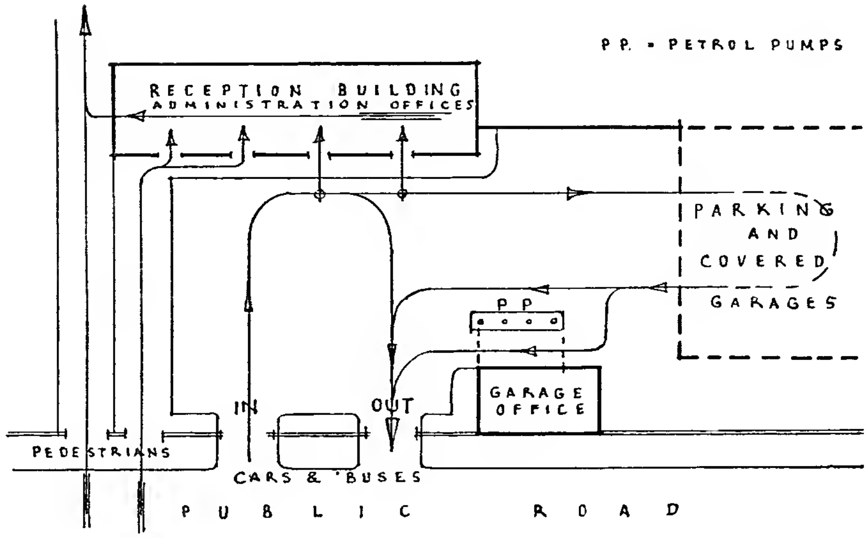



Fig. 10 Main entrance

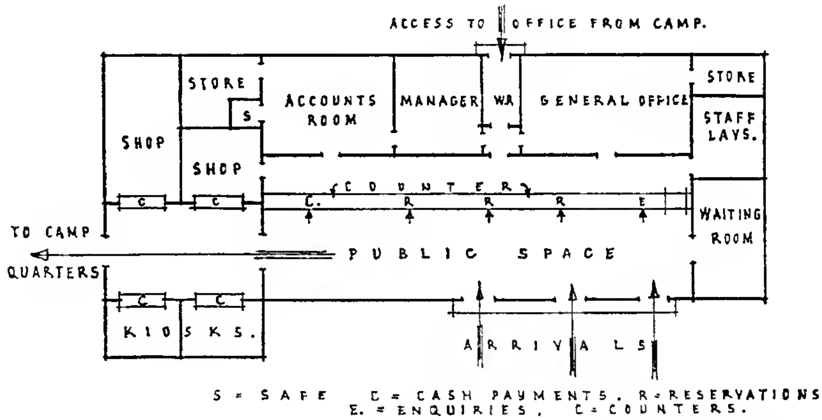



Fig. 11 Reception building

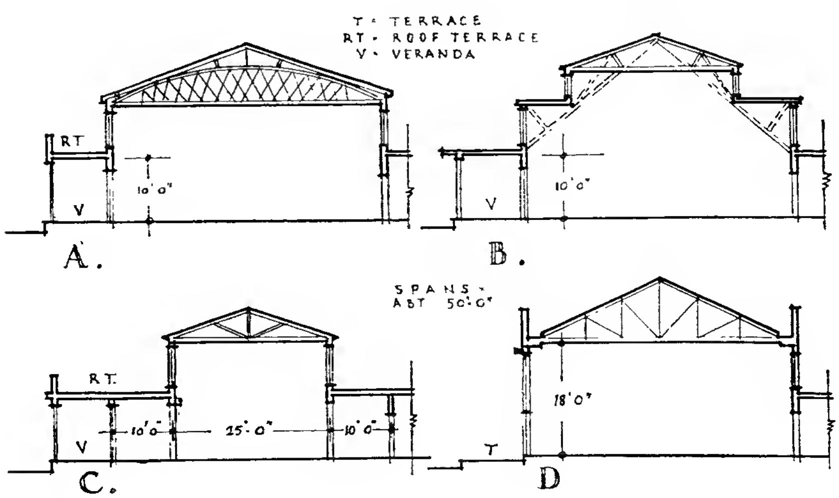



Fig. 12 Communal rooms: sections

not so much for reasons of escape as for the sake of keeping the floor space of the room clear and because, so arranged, they are more draught-proof in inclement weather. Terraces or covered verandas should adjoin or surround as much of the dining-room as possible. Such terraces are congregation places for guests before and after meals; in exposed positions movable glazed windscreens surrounding the verandas are a great advantage, especially as the verandas may be used not only as "foyer" space to the dining-room, but also as additional lounge space for serving afternoon tea. Dining-rooms should have ample external open space round one long and one short side at least.

In view of the large area of these rooms, care should be taken not to have ceilings or roofs at too low a level. Consideration should be given to insulation of the roof to avoid excessive heat (or cold) in the rooms; open roofs with only roofing material without an inner ceiling are apt to be uncomfortable in extreme weather and are somewhat unattractive in appearance. Artificial lighting should be borne in mind when considering the interior of these rooms, as a fairly high intensity, coupled with even distribution, is very important.

It is important to provide plenty of cloak space associated with the public rooms where visitors may leave outdoor clothing which may be needed in wet or cold weather for circulation between sleeping accommodation and the main buildings.

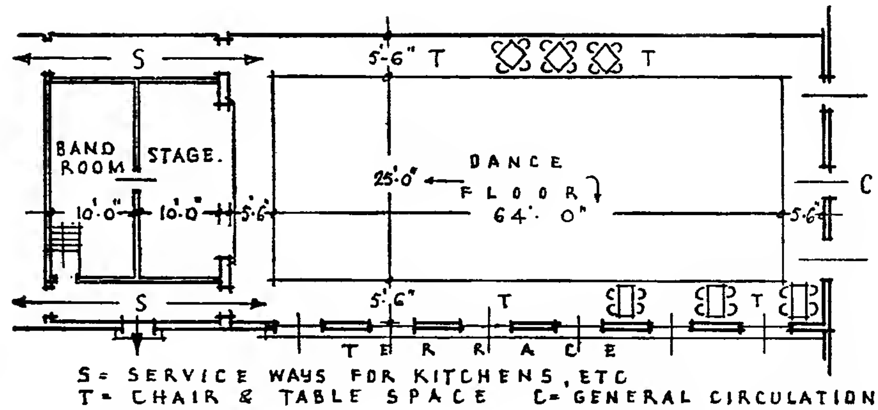


Fig. 13 A lounge with dance floor

**Lounges**

As previously suggested, it is desirable in all camps with accommodation for over 300 persons that lounges and ballrooms or other rooms used for the general entertainment of guests should be separate from dining-rooms; clearing the tables quickly after an evening meal, so that the room may be used for dancing or concerts, involves a considerable amount of labour, and is rapidly followed by the replacement of furniture ready for breakfast. If the dining-room is the only large recreation room, there is very little space available for the entertainment of guests on a wet day.

The total area provided for lounges, games rooms, etc., should be at least 10sq. ft. for every person up to the camp's maximum, an allowance which may be increased with advantage if it is considered that cost will permit additional space for these purposes. Certain games rooms, such as billiards rooms, may make additional revenue and thus justify their capital cost apart from general expenditure on communal rooms.

The main room required is a large one in which there is sufficient space to assemble almost the whole population of the camp for concerts, sing-songs, dances and similar entertainments. Frequently this room is used for the service of teas and in some instances alcoholic refreshment is also available, served either at bars or at tables arranged round a clear space used for dancing. Lounges and other public rooms must be spacious and sections similar to those suggested for dining-rooms in Fig. 12 should be adopted. Large glass areas, overlooking the gardens, should form the outer walls; terraces and covered verandas opening from the public rooms as additional lounge space are very desirable. A good proportion of the window area should be capable of opening to provide, on occasion, a semi-open-air appearance to the rooms and to add to the general effect and comfort on summer evenings.

In the main lounge, especially in large camps, a permanent stage for use at concerts, sing-songs and for a dance band, is desirable. As the floor of the room is flat the stage should be raised at least 3ft. 6in. above the general floor level if required for stage performances, although 14in. to 18in. may be sufficient for dance band purposes. Curtains and a properly equipped stage are only necessary in very large camps where cabaret and professional performances are likely to be given. To accommodate a small dance band the stage should have an area of at least 80sq. ft. for four performers, with an addition of 10sq. ft. per person over the initial four persons.

In large camps dressing rooms may be needed for artists, and in other schemes at least a small band room, having an area of about 100sq. ft., is a usual requirement; dressing rooms should not be less than 60sq. ft. for one person and rooms to be shared should be proportionately larger.

The area for dancing should be about 12sq. ft. per couple, but this is often reduced greatly, and a figure as low as 8sq. ft. is used; it is unlikely that a dancing area for more than 50 per cent of the total camp numbers at any one time will be needed. It is advantageous to place the stage at the end of the room, rather than on a long side, which is usual for dance bands, since it is likely to be used for concerts and similar uses.

Fig. 13 shows a typical combined concert room and ballroom for a camp. Alternative ballrooms are given in the section on "Hotels." Tables are usually needed round the dance floor proper, and for this purpose a space at least 5ft. 6in.—which is sufficient only for a single row of tables seating four persons—should be provided. Care should be taken to plan the room in such a way that quick and easy service for light refreshments during dances and for afternoon tea is available.

In addition to the general lounge, which may also serve as concert and dance hall, at least one other room must be furnished as a general lounge. In large camps the ballroom may be a special room, but in smaller camps this

separation is unlikely, so that a quieter room, in which visitors who wish to read or talk quietly may sit, is essential. A separate reading and writing room will probably not be needed.

### Club Rooms

Many camps provide club rooms, which are merely general lounges where alcoholic liquor is served, this arrangement separating the service of such drinks from the general lounge. Sometimes these rooms are equipped with bars and counters; in other schemes waiter service only is provided. When bars are provided, table space, in addition to counter stools, is essential, as some guests may stay in the rooms for long periods. Larger camps are likely to find that several small club rooms are preferred to one very large room, as a more intimate atmosphere may thus be created easily. The counters or dispense rooms will need very complete equipment, exactly as provided in similar rooms in hotels or public houses. Suitable storage space for these rooms is needed, and if draught beers are to be sold a cellar is desirable; precautions must be taken to obtain correct temperatures for beer storage.

### Service Rooms

A little food will probably have to be served in some of the public rooms, in addition to the main dining-room. Apart from food service, drinks, both alcoholic and soft, are likely to be needed in lounges and ballrooms, even if no meals, such as afternoon tea, are served except in the dining-room proper. Consequently, all communal rooms where service is needed must be grouped together as much as possible and so planned as to avoid service circulations meeting or crossing guest circulations. Certain rooms, such as club rooms or bars, however, may be isolated, since they do not require constant communication with kitchens and other service rooms, and may be restocked from the main storage from day to day at times unlikely to interfere with the comfort of guests.

In some types of holiday camps the dining-room services are based on a cafeteria or self-service principle, and such a system may be considered quite satisfactory for camps where very moderate charges are to be made; it is doubtful, however, whether self-service can be operated if the number of visitors exceeds 400, as there is likely to be too much congestion at the service counters. If self-service is adopted longer service counters and consequently more service room floor area is needed than when waiter service is provided. Kitchens and service rooms should be based on serving "table d'hôte" meals with a limited number of alternative dishes. A floor area of approximately half the area of the dining-room should be sufficient for the kitchens and all ancillary rooms. The amount of storage space needed is likely to vary considerably, depending on the proximity of markets and the frequency at which deliveries are obtainable.

The circulations needed in the kitchens and service rooms should be considered very carefully when planning these rooms. The two important circulations are, first, the passage of the food itself from the point of delivery through the preparation and cooking to the servery counters and, secondly, the waiters' circulation with food and china between the servery and the dining-room tables.

The delivery entrance should provide ample forecourt space for large vehicles drawing up to the doorway and turning; a forecourt or yard which can be enclosed or otherwise screened from general view is most desirable, as a certain amount of untidiness, due to empty containers, dustbins, etc., cannot always be avoided. Ample space is needed at the entrance for handling, checking and weighing bulk deliveries before the goods are taken to the main storerooms. The latter (except those for the bulk storage of dry goods) should be grouped together, and should be related closely to the kitchen. Any refrigerated storage provided for goods such as dairy produce, meat and fish should be kept together. Vegetable storage and the vegetable preparation space should be placed adjoining.

The circulation in the servery should be arranged so that the waiter enters the serving space and passes the wash-up for china and glass, the cold counter, the hot counter and still room (in that order), and can then return to the dining-room by a separate door. As all meals are included in the charge to visitors, no checking is needed, except for chargeable extras, such as soft or alcoholic drinks. Considerable detailed information on the planning and equipment of kitchens and service rooms, which in general applies equally to holiday camp kitchens, has already been given in various other sections of this book. Ample daylight is most desirable and a cool aspect should be chosen for windows and for any roof lighting introduced. A limited amount of extract ventilation to eliminate the penetration of the smell of cooking to the dining-room should be provided.

Grouped with the kitchen accommodation should be a staff dining-room. This may also have to serve as a staff lounge, unless there is a room for the latter purpose attached to the staff sleeping accommodation.

### Boiler Room

It is often convenient to attach the boiler room to the kitchen group, which is likely to be the main user of steam and hot water. The communal baths and the bulk of the lavatories may also be placed in the main building to avoid the cost of providing long rows of hot water service piping to reach blocks planned on other parts of the site; this question will be discussed later.

### Linen Store

A large room is needed for storage and control of all linen for the camp and, for convenience of supplies to the dining-room and for supervision, it is advantageous that this should be placed near the main service entrance. It must be large enough for storage of all linen needed for the camp, and also have space for the staff to sort, repair and issue supplies. Access from the sleeping accommodation without having to pass through the kitchen is essential as on certain days large quantities of linen are handled and inconvenience would be caused if the staff passed through the kitchen or other service rooms with loads of linen. A counter should be provided so that the general staff does not have access to the linen racks.

### Staff Accommodation

Camps are often distant from an adequate supply of labour or from housing for any seasonal staff brought into the district; it is therefore generally necessary to provide accommodation for the greater part of the camp staff including, in some instances, married quarters.

The various grades of staff require different and separate quarters and the sexes may have to be provided with separate accommodation. Staff usually

falls into the following groups: management, office and supervisory, kitchen and restaurant, general staff. Separate bedrooms are needed for the management, office and senior staff of all sections, but maids, kitchen staff, waiters, waitresses and general staff (porters, cleaners, etc.) often share quarters, two or three or more in a room; or have large rooms divided into cubicles, or else open dormitories.

All staff accommodation, since it is occupied continuously by the same people, should be designed on a basis similar to that provided for the visitors. Staff quarters are often placed in a separate block quite apart from the main camp buildings; the management staff, however, is sometimes associated with the offices of the main building, but on an upper floor or separate wing.

### Recreation

As much space as possible should be set aside for formal and informal recreation, and the open spaces should be in large units to assist this purpose. Lawns for simple unorganized games are needed, as well as pitches or larger spaces for games such as cricket, rounders, tennis and deck tennis. For children it is desirable to arrange a definite playground with a sand-pit, swings, etc., which would probably be supervised by an attendant.

Information on planning for recreation is given in Part 1: Recreation and the data applies also to this section. Many camps provide a swimming pool and the planning of this unit should follow the information given in the section on "Open-air Swimming Baths" bearing in mind, however, that little dressing accommodation is necessary—since guests use their own bedrooms for changing. Near the bath there must be ample lawns and/or terraces for sunbathing, while large camps may need a stand for spectators.

### Sleeping Accommodation

The types of sleeping accommodation have to be varied to meet different needs. Some camps provide chiefly rooms with two beds, which are used for married couples, or have to be shared by two single persons; the idea of sharing with a stranger is unpopular, therefore some single rooms are essential and a fairly generous proportion is desirable. There is a considerable demand for groups of rooms, more especially one double room with one or two single rooms adjoining, for family use. The maximum of privacy for each person, couple or family is the desirable aim and the most difficult factor to provide satisfactorily. Single rooms should have a floor area of at least 65sq. ft., and double rooms not less than 90sq. ft. to 100sq. ft.; these areas are not only desirable for health, but the necessary furniture cannot be accommodated in less space. The furniture provided usually consists of only the barest necessities, comprising one or two single beds—double beds should be avoided, as they limit the use of the rooms and involve the provision of two types of bed linen, both for single and for double beds—a combined dressing-table-chest-of-drawers with mirror attached or on the wall above it (or over the lavatory basin), a wardrobe or curtained hanging space for clothes, where luggage may also be placed, and one chair per person, the last often being of a camp folding-armchair type, which can be used also on the verandas or in the gardens. It is desirable that bedrooms should be 8ft. high, but some authorities may permit the use of lower ceilings or roofs for at least part of the area of the room.

### Pavilion Types

As stated above, there are both advantages and disadvantages in the selection of pavilion blocks as opposed to individual chalets. Chalets probably give more privacy, with less penetration of noise. But the wide spacing and longer paths needed for chalet schemes are not economical in space. Continuous covered ways for access in wet weather are more easily provided in pavilion type plans, construction is probably more economical and the appearance may be better because grouping is easier and there is no repetition of very small units.

Figure 14 illustrates two typical arrangements of pavilion-type sleeping accommodation together with the sanitary units attached to them. Both of the types shown are based on a main north and south axis with the rooms facing both to the east and west. If the aspect is changed so that the main axis is east to west, the double-sided plan is undesirable as certain rooms would have a northerly aspect.

The plan shown in Diagram A may be either an independent block or a unit with possibly a covered approach at one end, whereas the plan in Diagram B has a series of units interspaced on each side of a covered way. The main differences indicated by the plans are the placing of the sanitary units. It is desirable that some sanitary accommodation should be planned within 200ft. of all sleeping rooms or units in order to be available for night use without the necessity of guests having to go to the main buildings, where the bulk of the sanitary accommodation is often provided. Diagram A suggests grouping the lavatories at the end and in the centre of the block, this division being needed only if the block is very long. The central lavatories are approached from a covered way, and if both those for men and for women are placed here in shorter length units, the doors should be kept as far apart as possible. If all the lavatories for a unit are grouped together as in Diagram B, access is better planned from different sides under each covered way or veranda, as indicated in the diagram, rather than from the ends—unless the veranda is carried round as in Type A, involving extra cost. These lavatory units may in some schemes include bath rooms with either shower or tub baths and also lavatory basins, although the latter are unnecessary if each room has its own basin. If hot water is to be provided, lavatory basins may be needed in the lavatory blocks as well as in the rooms. The latter would probably have cold water only and to facilitate hot pipe-runs in such a scheme as shown in Diagram B it may be found advantageous to place the lavatory units adjoining the main covered way, beneath which a pipe duct could be formed.

Fig. 15 illustrates two typical detail plans of pavilion-type sleeping units. Diagram A provides for double-bed units on one side of the block and single-bed units on the other side, so arranged that suites of one double- and one single-bedded room may be formed for family occupation. Diagram B shows all rooms of the same size, each equipped with two beds. Verandas are desirable although they may not always be strictly necessary—especially in a plan such as in Diagram A, where the veranda might be confined to the side on which the double rooms are placed.

It may be found that some units of accommodation, such as one double room with two single rooms attached, may be provided more easily and

economically in the chalet type than in the pavilion type of plan.

The room sizes may be the same as suggested for similar needs in chalet-type plans, for the furnishing will again comprise only bare necessities.

In pavilion types, in addition to the entrance doors, windows should be provided on the front external wall; no other wall is available for the purpose and reliance cannot be placed on ventilation solely by means of doors with fanlights over.

If it is considered desirable to provide hot-water basins in the bedrooms for camps with a clientele paying higher prices, the pavilion type of plan lends itself more readily, since the pipe-length may be less and many more of the pipe-runs are insulated within the building. It may be considered worth while to build the centre division as two walls, thus forming a duct for all pipes and services for the full length of the pavilion unit so that all the pipes are readily accessible; such ducts must be sufficiently wide for a man to work in reasonable comfort. This separation also assists in the reduction of noise between rooms.

Methods of light construction similar to those suggested for chalets may be adopted for pavilion units, but pavilions lend themselves to substantial and permanent methods more readily than chalets.

If pavilion units are very long it may be considered desirable to provide covered passage ways from side to side, at least in the centres of blocks, if not more frequently. Thus long walks to reach one room from another, when the rooms are let to families or parties of friends, are avoided and access to the different gardens and play areas in the camp is improved.

### Dormitories

Sleeping accommodation for camps to be devoted to the needs of children—with only a few adults as supervisory staff—is probably more satisfactorily provided in the form of dormitories than in a large number of small rooms. Dormitories provide better supervision, ventilation is better controlled, and space is saved. Dormitories may be of almost any size, which, up to a certain point, should be settled by the number of staff available for supervision; the staff may be accommodated either in the dormitories, in cubicles partitioned off from the dormitories, or in single

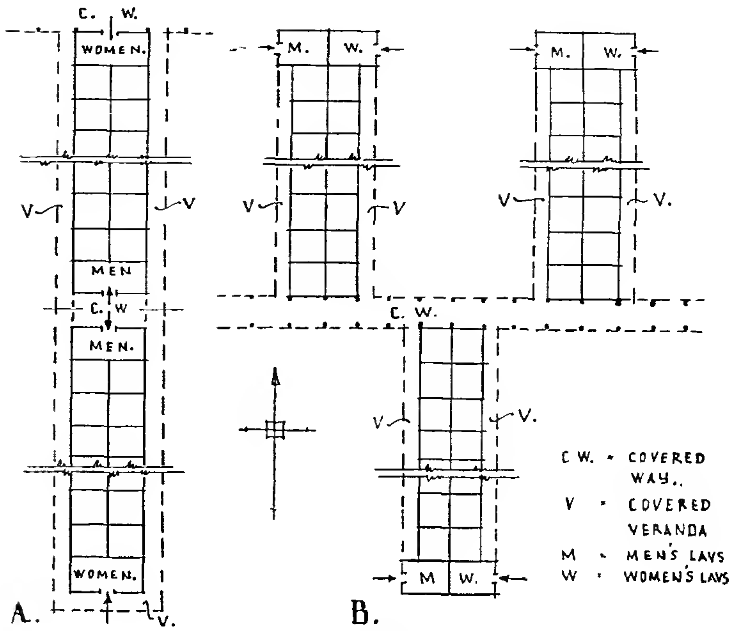



Fig. 14 Pavilion blocks and lavatories

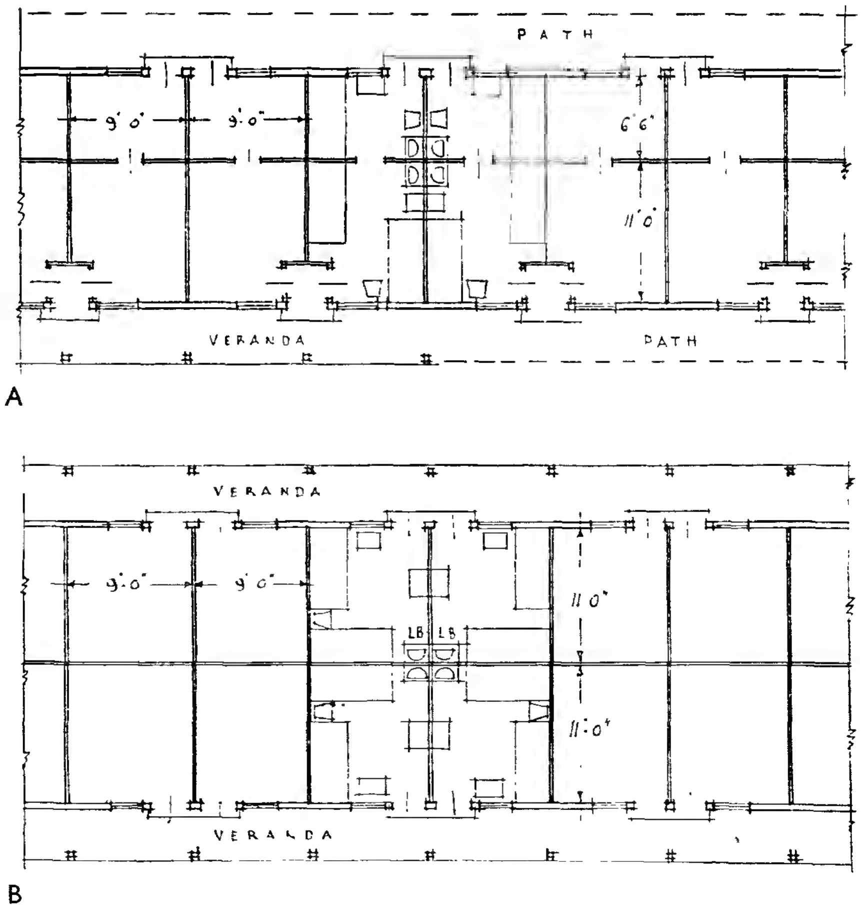



Fig. 15 Pavilion types

rooms adjoining or between each pair of dormitories.

The spacing of beds in dormitories should be based on the use of normal single beds, 6ft. 6in. by 2ft. 6in., which could be used by adults if required; at least 50sq. ft. of floor space should be allowed per bed, and this may be increased with advantage to 60sq. ft., especially if the rooms are not very high. Fig. 16 illustrates typical spacing of beds based on a minimum allowance of 5ft. 6in. centre to centre. This allows 3ft. between beds and a central gangway 5ft. wide between ends of beds; the figure is thus based on an allowance of 50sq. ft. per bed.

If economy is a major consideration, dormitories should have beds on both sides of the room, although plans with beds on one side only may be more pleasant. Windows should be placed on both sides of the rooms to ensure adequate cross-ventilation. It is probable that each person will require, in addition to the bed, one piece of furniture, such as a locker or chest of drawers, placed under the windows and between the beds, for storage of clothes and personal belongings. Provision for outdoor clothes (hats and coats) may also be considered necessary; this may be in the form of a rack in the centre of the dormitory, or—better—in a lobby adjoining the room.

Fig. 16 also shows an outline diagram of a single-story dormitory block for 40 children, with space for emergency W.C.s or chemical closets and for one or two basins attached at one end; such a space or lobby might alternatively be used as cloakroom for outside clothes and the storage of towels and personal washing apparatus (toothbrushes, etc.). This is an essential provision when all the lavatory facilities are planned in a central group or groups and not attached to the dormitories themselves. It may, however, be considered desirable to plan a lavatory unit between each pair of dormitories or even attached to each unit and then basins should be provided in about the proportion of one to each six persons.

It is desirable to place the W.C.s—except those for emergency night use—at a distance from the units. If there is any likelihood of the dormitories being used in the colder months, provision must be made for heating and draught lobbies formed at entrances to the dormitory units.

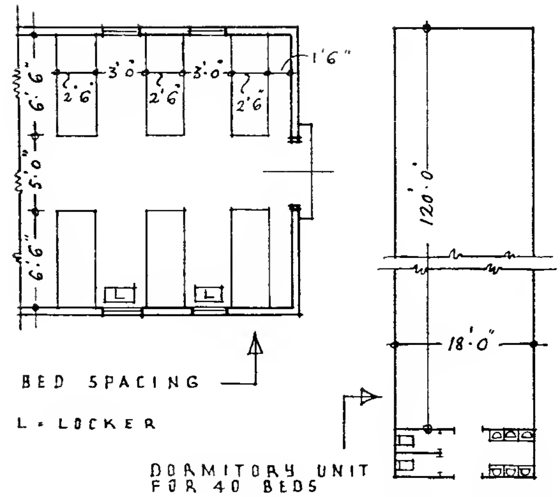



Fig. 16 Dormitories

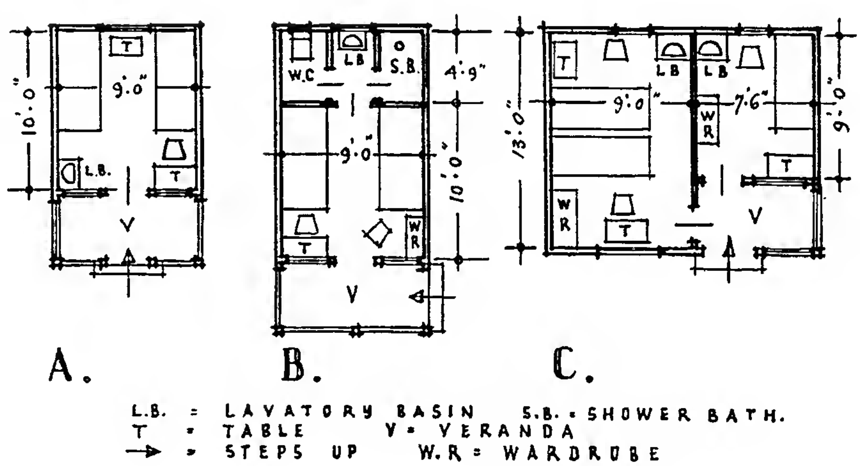



Fig. 17 Types of unit " chalet "

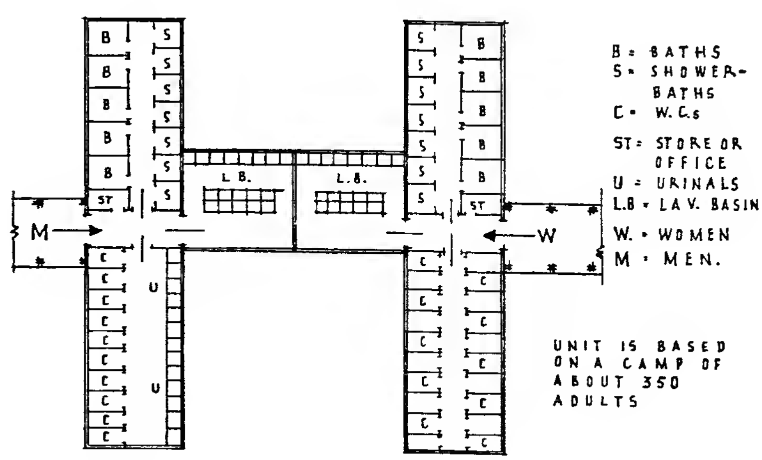



Fig. 18 A sanitary block

### "Chalet" Types

Fig. 17 illustrates various types of bedroom plans based on the independent "chalet" or hutment type of sleeping accommodation. Diagram A shows the smallest type of double room desirable; in front is a veranda from which the room is approached. The room has a glazed door with opening side lights at the entrance end and a window on the opposite end. A lavatory basin is provided, although cold water only may be available—as will be discussed later.

Diagram B shows a more elaborate type with a W.C. and shower bath attached for the sole use of the occupants of the room; this type is not often used and is much more costly than the other types, mainly on account of additional plumbing and drainage.

Diagram C gives a unit of a double and a single room which is likely to be in frequent demand; this again has a veranda which is shared by the two rooms.

Verandas are desirably attached to each chalet for use as a semi-private sitting space and as a shelter in bad weather; in addition they provide a protection to the room when the door is open. Verandas are frequently made too small and should not be less than 4ft. wide; deck chairs are about 3ft. 8in. long without leg rests and cannot be used with comfort in a space less than 6ft. long; a width of 4ft. permits the use of folding camp armchairs of the type so often provided in the bedrooms.

When a chalet system is adopted for sleeping accommodation it is usual to place the chalets about 5ft. apart in order to isolate them and reduce the penetration of sound. It is advantageous to place the chalets in rows facing the same way, thus retaining a similar aspect for all of them; this layout also adds to privacy as verandas and entrance doors to chalets do not face one another. The rows of chalets must be spaced far enough apart to provide an access path, not less than 6ft. wide, separated from the verandas by grass and/or flower beds to assist privacy; the spacing between the fronts of one row and the backs of the next should not be less than about 15ft. Access paths should be constructed of hard materials such as paving or tarmac, which keep clean and dry quickly in wet weather. Artificial lighting should be provided.

The actual construction of the chalets is outside our scope, but it may be noted that light construction with timber framing is frequently used, covered externally with plaster, asbestos, timber, etc., with roofs covered with similar materials.

Resistance to fire and cost of upkeep, together with the length of life, should be considered carefully in the selection of materials and types of construction.

The sanitary accommodation for chalet types, except where Type B is used, should be grouped together for a number of chalets and placed in an inconspicuous position; the subject of sanitation is discussed in greater detail later.

### Sanitary Accommodation

This may be attached to sleeping pavilions or arranged in conjunction with groups of chalets (as already described). Alternatively, it may be provided in a centralized building devoted entirely to W.C.s, lavatory basins and baths, for each sex. How the accommodation is arranged depends largely on the drainage system available, but it should be remembered that to disperse the sanitary accommodation over the site effects a big increase in the cost of drainage and services. At the same time, there is much greater convenience, comfort and privacy for guests if at least some of the sanitary accommodation is dispersed among the sleeping accommodation. Some lavatories and W.C.s near the communal buildings are essential. In most camps, catering for the summer months only, baths are not provided in any number, apparently in the belief that most people bathe in the sea or swimming baths. However, it seems likely that many guests will desire hot baths from time to time during their stay and provision for this should be made. For economy it is wise to group baths together, even if W.C.s and lavatories are spread over the site, because of the hot-water services needed. It is advantageous to place the baths near the boiler house, and consequently near the kitchens, which constitute the other main heating load. Baths may either be of shower or tub types; the former do not seem very popular with women, but occupy less space. Baths, both shower and tubs, are provided in proportions varying from one per hundred guests to one per fifteen guests, according to the charges made for accommodation. W.C.s should be provided in about the proportion of one to twelve guests, with urinal accommodation in addition, although the number of guests per W.C. might with advantage be reduced and, if the accommodation is spread, the proportion may need to be one to eight guests. Basins need not be provided in large numbers when each sleeping room is provided with its own basin, but if only a central lavatory group is planned, basins should be provided on the basis of one for every eight or ten guests. Fig. 18 illustrates a typical unit for a camp of about 350 persons. The separation of the entrances for each sex should be noted; also the provision of a small room or office, which is likely to be needed in a unit of this size, for an attendant. A two-storied sanitary block may prove to be a more economical proposition, although less convenient, where large numbers are catered for, by reason of the more compact methods of drainage possible; if this type is used, the women's accommodation should be placed on the upper floor.

### Laundries

Most camps make no provision for washing clothes, except in so far as guests may wash certain articles in the lavatory basins or bathrooms.

If, however, camps are likely to be used for long periods, or very young children are accepted as guests (some camps have a minimum age of two years), consideration should be given to the installation of a small laundry unit for guests, with sinks, drying facilities, wringers and irons. The camp washing of table- and bed-linen, etc., is generally handled by a local laundry, except possibly in the case of very large camps where a laundry might justify the necessary capital outlay.

# Holiday Hostels and Camps

## CAMPS FOR MOTORISTS

### Introduction

It has been stated recently that American and other visitors would appreciate the provision of " motels " or camps for motorists in the tourist areas of Great Britain. These camps would provide permanent or semi-permanent tourist accommodation of a type which is beginning to be developed in this country. As organized in America, they consist of simple accommodation and service for motorists on lines somewhat similar to those already provided, in this country and on the Continent, in youth hostels, for those who walk or cycle.

Accommodation for such purposes need not be so elaborate as that in normal hotels and would generally be preferred if situated outside or away from large towns or any places particularly or usually labelled as " resorts." The accommodation may be used by those wishing to stay anything from one night to a full month's holiday, but is more likely to be wanted mainly for short periods of from two to three days only. Motor camps of this type are essentially suited to areas remote from good public transport facilities and can well be sited in locations to which considerable travelling is a necessity in order to enjoy the natural sights or beauties. In most cases, therefore, this type of accommodation is intended for the average tourist and has, consequently, to provide facilities at costs well below those of normal hotels. Often the user provides much of his own service, sometimes does his own catering and even supplies equipment such as sheets, blankets and towels, as in fact is usual in youth hostels. An additional factor likely to influence planning is that the proportion of older visitors is likely to be much greater in camps for motorists than in youth hostels: therefore, the accommodation must provide a higher degree of comfort and amenity than is needed by younger tourists.

Many schemes of this nature are in operation in the U.S.A. and in Canada and have proved to be very popular with " family tourists "; not only have they been planned in association with national parks and similar tourist centres, but they also may be found near many large cities where accommodation is provided for less wealthy motorists.

Often these motor camps are designed for seasonal use only, but week-end accommodation may be required for most of the year in many situations.

The key staff is likely to be resident throughout the year and staff accommodation must be designed and planned to be suitable for all seasons.

Many camps provide not only facilities and service for those who wish to stay a night or longer but also supply single meals and other casual services to passers-by.

The buildings for a motor camp fall into two main groups; firstly, sleeping accommodation for visitors and the housing of their vehicles; secondly, central accommodation for services, including those needed for resident staff and for catering facilities for all types of tourist traffic. It is possible that camps may also be required in association with rivers, estuaries and inland lakes where accommodation can be provided for motorists who also use yachts and motor boats not equipped with sleeping accommodation, or who wish to fish or observe nature.

### Alternative Camping Provisions

In addition to the permanent or semi-permanent type of motor camp to which these notes chiefly apply, there are already camps or camp sites which provide for the accommodation of motor caravans, trailer caravans and tents. There may be a demand in the future for composite camps containing all these different types but, since motor camps provide more facilities, those for caravans and tents might not need such extensive services and would be merely provided, therefore, with properly equipped camping-sites.

### Legislation

All permanent and semi-permanent camp developments involving the use of land for camping for more than 28 days per annum come under the Town and Country Planning Act, 1947 (Section 12) and within Development Orders made thereunder. All camp buildings of a permanent or semi-permanent nature are required to comply with the local by-laws made under the Public Health Act, 1936. Tented and caravan camps are subject to Sections 268 and 269 of Part XI of the Public Health Act, 1936, and to any local by-laws made thereunder.

Normally camping-sites have to be licensed and it is necessary to provide an adequate supply of water, sanitary accommodation with proper means of disposal of wastes therefrom, together with proper sanitary bins for disposal of litter and garbage.

### Sites

The site area required depends almost entirely on the number of visitor-units to be provided. It should, however, also include sufficient space for private systems of water supply, sewage disposal and electric generators, if any of these facilities are not available from public services. The site should, if possible, be well treed; alternatively it should have adequate space for trees planted to serve as screens and as wind-breaks. If a good water supply is not available, special care should be taken to ensure that an adequate supply can be obtained on the site itself by wells, rams, pumping or by other means.

It is important that great care be taken in the selection of sites, that the camp should not mar natural scenic beauties and also should not disturb the normal life of villages or towns in the locality. It is desirable that sites should be reasonably level to avoid undue capital costs in road-making and the preparation of parking- and building-spaces. The aspect of the site is probably not of very great importance if the layout allows for suitable aspects of the individual parts of the accommodation. Sites placed in valleys and mountainous districts should be selected so that they are not unduly over-shadowed. Equally, sites in clearings in woods or forests must also be adequate to prevent excessive over-shadowing of buildings and to allow adequate air movement. Account should be taken of special prospects, such as views, scenery, lakes, etc., in both the selection of the sites and the disposal of buildings on them. It is important also that camps should be designed to settle into the landscape and not be detrimental to the natural advantages of the area, whether it be in a reservation, such as a National Park, or not. It is not of great importance that sites should be in close proximity to main roads, but it is important that there should be adequate approach roads designed to carry traffic in both directions.

If it is intended to cater to any extent for tourists *en route*, by the provision of such facilities as a restaurant or a petrol station, the site should be fairly close to a highway carrying a reasonable amount of traffic. Wherever the site may be,

however, it will be important, for some considerable distance away from it, to display adequate direction signs—at least on the nearest main traffic roads. It should be borne in mind that such signs are now subject to the regulations governing advertisements issued under the Town and Country Planning Act, 1947.

The essential factors are to make the whole scheme as attractive and pleasant as possible and at the same time keep the work of maintenance to a minimum. Simple lawns, or at least grass kept cut reasonably short with beds of flowers and flowering shrubs, some seating, and trees for shade in hot weather can all form elements in the simplest of schemes. Paths and roads should be of materials which remain, or can be kept, reasonably clean in wet weather, cambered to throw off water quickly and carefully drained. Bituminous macadam or concrete are desirable for roadways, especially where vehicle-turning is involved.

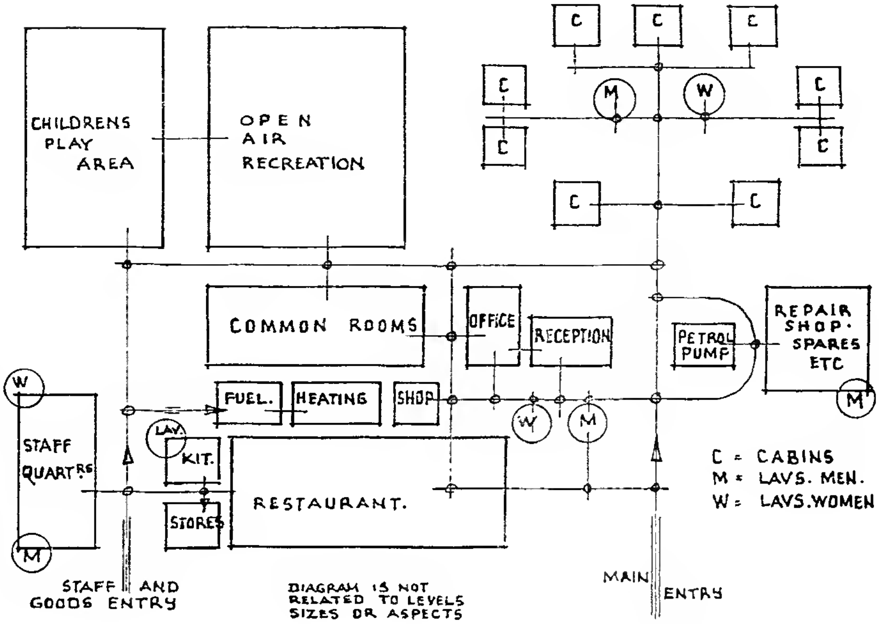



Fig. 19 General analysis

## General Layout

Fig. 19 illustrates diagrammatically the relationship of the various parts of a motor camp to one another and to the surroundings. There should be one main entry to the site for all visitors—both casual guests for meals and those staying in the camp. Petrol pumps, service stations and repair shops should be well separated from the other camp buildings. If a restaurant is provided and it is to cater for passing trade as well as for the camp, it should be sited near the entrance and so planned that there is no need for casual users to go near the residents' portion of the camp. Separate car-parking facilities can well be made available for the restaurant trade. All traffic entering the camp should pass the main reception office before reaching the sleeping accommodation. Adjoining the reception unit there should be planned any common rooms forming the central buildings; these should also incorporate general services such as heating, fuel storage and kitchens. The guests' sleeping accommodation, with the necessary toilet facilities, should be planned away from road traffic and the restaurant to provide maximum quietness. Some recreation space for use by resident visitors and their children should be planned in association with the sleeping- and common-room units. A separate entrance for goods and staff is desirable, leading to an enclosed kitchen yard near which should be planned any garages for staff vehicles.

## Petrol Sales

This may take one of two forms: firstly, a unit associated with the camp and its buildings, or, secondly, a separate unit planned on a road at or near the point of juncture of the local road to the camp site. In the second type it is likely to be operated on a lease or a concession basis. Full information on the planning of petrol stations is given under "Garages and Parking Spaces." Great care should be taken to place the petrol station where there is no fire risk to the remainder of the camp; also the coming and going of vehicles, if the pumps are available at all hours, and other incidental noise, must not be disturbing to the camp residents.

## Repair Facilities

These may be facilities for visitors wishing to carry out their own small repairs and minor overhauls. On the other hand it may be worth while incorporating a small repair service in charge of a competent mechanic, operated by the camp or let out, perhaps with the petrol station, as a concession and which will provide services for the vehicles of both camp visitors and passers-by. For reference to detailed planning *see* the section "Garages and Parking Spaces."

## Night Lighting of Paths and Roads

It is desirable to provide adequate lighting of all access-paths and roadways within the camp to assist strangers to find the way from cabins to the central building or to toilet units, etc. Lamp-posts should be placed well clear of paths; their height and spacing is dependent on the type and power of the lamps installed.

## Recreational Facilities

These depend largely on the space available and to a measure on the anticipated duration of a visitor's stay. If the stopping-period is mainly to be one, or at the most two, nights little provision need be made, except possibly a small children's playground. If the period is to be longer it may be desirable to use part of the ground as a play-space, even constructing tennis courts and/or a putting-green.

In some larger schemes, where water supplies permit and the climate conditions are suitable, a small swimming-bath might be an added attraction. Such a bath might, in some cases, be formed by damming a stream where this is possible and an adequate water supply is not otherwise available.

## Entrances

As camps for motorists, except when very small, may involve a considerable amount of traffic entering and leaving

the site it is important that the planning of the entrance to the site be given careful thought. A simple drive-in with gates on the road side is likely not only to be missed by strangers approaching the site at speed but can also be very dangerous; it is desirable to separate "in" and "out" traffic as shown in Fig. 20. An arrangement of this type provides a suitable space for a sign easily visible along the main road. In larger camps any long approach drive should be 20ft. wide to permit two lines of traffic and space for pedestrians; if, however, the approach road is of some considerable length its width may be reduced to 10ft. if "lay-bys" at least 40ft. long are provided every 300yds. along the road. Each lay-by should be so placed as to be visible from the next, in both directions.

It is desirable to plan camps on land well away from main roads, to provide quiet and privacy for guests; in such case adequate direction and instruction signs, preferably illuminated at night, should be placed on the main road near or at the entrance to camp sites. If camps are to be used by trailer caravans care must be taken to plan the entrances and road junctions carefully as the combined lengths are great and the radii of curves and roads, if too small, may be difficult to negotiate.

#### Essential Dimensions and Spacing

The dimensions of private motor vehicles have already been given in a table in Part 1: Transport (*q.v.*); the provision of standings for cars should be based on maximum sizes of vehicles to prevent the need for retaining special places for larger-sized cars. Fig. 21 illustrates the dimensions of trailer caravans and luggage trailers; caravans of a non-trailer type are seldom used, although the dimensions of these may be up to the maximum legal limit of commercial vehicles, which varies, according to the type and the number of wheels, up to 33ft. long by 7ft. 6in. wide.

Sizes of tents vary considerably: a tent for a single person may be as little as 2ft. 6in. wide by 6ft. long and family-sized tents may be almost any size. For the purpose of planning it is useful to assume that they will occupy an area of 12ft. diameter.

Tents and caravans should not be placed nearer together than 10ft. in any direction. Caravan spacing should be based on the assumption of an occupied space of 20ft. long by 7ft. 6in. wide; thus sites should be based on not less than 30ft. centre to centre and 17ft. 6in. centre to centre in the side-by-side direction. This minimum spacing should, however, be increased if the motor vehicles are to be parked adjoining the trailers.

#### Types of Camp

There can be many types of camp for motorists, as shown in Fig. 22. Those using permanent or semi-permanent cabins, are shown in Diagrams A and B. The accommodation may be either detached cabins with an adjoining berth for the user's car, as shown in A, or semi-detached and grouped cabins with grouped car berths, as shown in A1. Grouped cabins are useful for family occupation where single two-bedded cabins do not provide the required sleeping accommodation. An alternative to car berths adjoining the cabins is shown in Diagrams B and B1. Here all cars are berthed in one or more large parking-spaces or in covered, or even enclosed, garages; this type may be more economic on some sites, for less hard roadway is needed, but it is a method likely to prove less popular with users.

Diagram C illustrates the type of trailer caravan camp where the trailers are planned at least 10ft. apart with the cars parked adjacent to each caravan. As the trailers are heavy to move by hand, all camps should be planned on the assumption that the car is made readily available by being parked at the side or at the end of the trailer. This may also be necessary if trailers depend on the car batteries for lighting. If camps are to be used constantly for many months of the year it is desirable to provide concrete or similar hard-surface standings for both trailers and cars.

Diagrams D and E illustrate tented camps which may also be based on parking vehicles adjoining each tent or in central parks or garages. In all camps of a permanent or semi-permanent nature designed to house more than one group of users, latrines should be placed at least 40ft. from sleeping quarters; if, however, water-borne disposal systems or chemical closets are used the accommodation may be planned nearer to cabins. In the case, however, of grouped chemical closets it may be desirable to adhere to the separation distance of 40ft.

#### Grouping of Cabins

There are many possible methods of grouping cabin units within the camp sites, but all should be related to the provision of proper aspects and also avoidance of long distances from sanitary units to central or communal buildings. Very careful consideration should also be given to economy of road-making, although units excessively closely spaced may involve loss of privacy, which is undesirable, and must be balanced against cost of layout.

Fig. 23 shows the grouping of various types of cabin unit, already described, round central but screened sanitary units. All the cabins shown have individual parking facilities. Fig. 23A shows the effect of combining single-storied and double-storied cabin units on a staggered plan to attain the maximum amenities in respect of privacy, air and aspect. The figure also shows desirable minima for road widths, etc., and the use of one-way traffic throughout a single group of units.

In a large camp the type of grouping shown in Fig. 23 and in Fig. 24 might be repeated a number of times in different parts of the camp and at various distances from the central buildings. Fig. 24 shows single and double cabin units arranged round a central car park, at one end of which is a sanitary unit for each sex. By careful grouping monotony can be avoided.

It is very desirable that all access between the cabins, roadways and central buildings be hard-surfaced and well-drained. Roadways in which vehicles may have to turn or back must be at least 20ft. wide and all roadways for one-way traffic must be at least 10ft. wide. Roadways to which two-way traffic has access should be avoided whenever possible, but if they are provided they should be at least 18ft. wide. It may frequently be desirable to plan wide access pathways on which a truck may be moved for transport of bedding, furniture and other cabin equipment; such pathways should be at least 10ft. wide while normal access-paths to cabins should be at least 4ft. 6in. wide, to permit two persons to walk abreast comfortably. In camps likely to be used in winter, or those sited in areas liable to heavy rainfall at all periods of the year, it may be found desirable to provide covered access from cabins to sanitary units and, to a lesser degree, to the central building.

## CAMPS FOR MOTORISTS

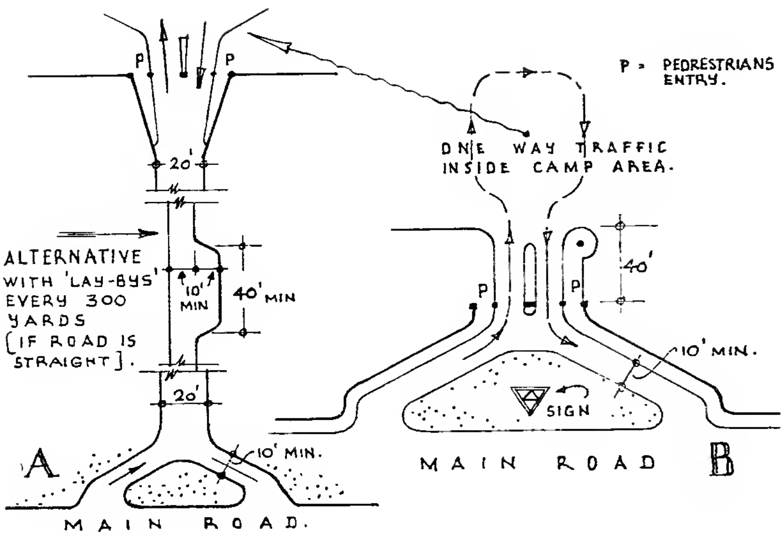



Fig. 20 Entrances

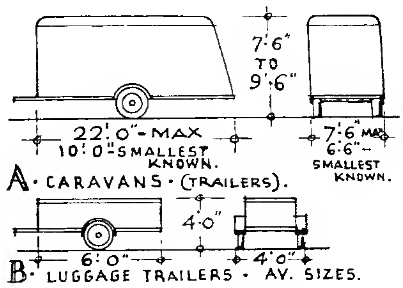
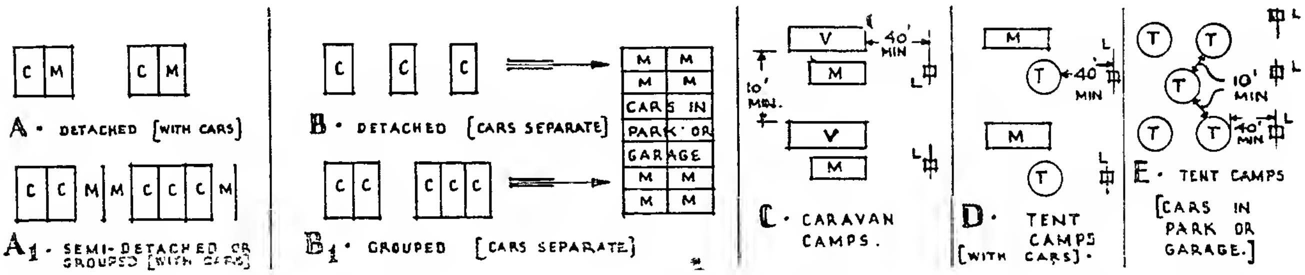



Fig. 21 Trailer data




KEY
C—cabins
M—motor-car berths
T—tents
V—caravans
L—latrines

Fig. 22 Types of camp: permanent or seasonal

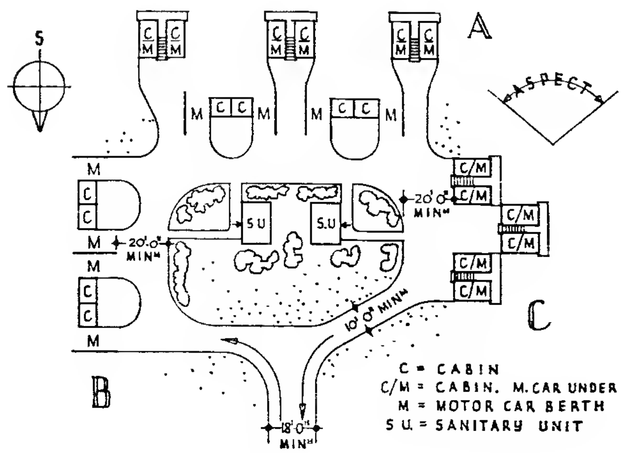



Fig. 23 Grouping of cabins, etc.

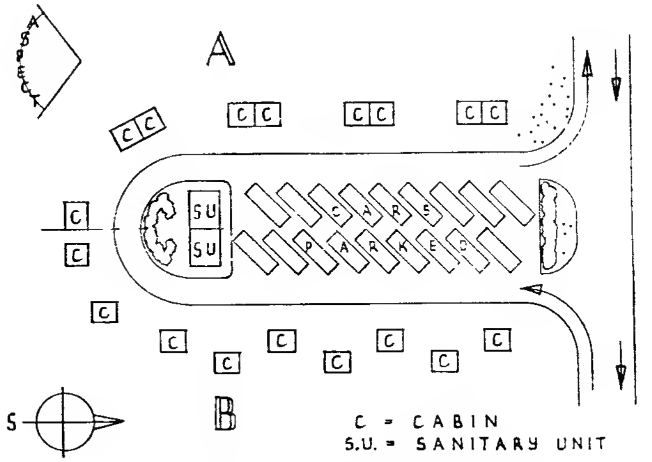



Fig. 24 Alternative grouping of cabins, etc.

# *Holiday Hostels and Camps*

## CAMPS FOR MOTORISTS

### Cabins

Accommodation for the individual visitor to motor camps may be provided in various forms. The most common appears to be that provided by the chalet or separate cabin, similar to those described in the section "Holiday Camps." These cabins sometimes take the form of small double bedrooms with an individual car shelter attached, sometimes the form of a unit for family use having several bedrooms with shelter for one vehicle; alternatively, several bedroom units are grouped together with shelter for several vehicles. The latter type can be arranged to be used either as a family unit or by several separate visitors. In some schemes the cabins are all grouped together as in a holiday camp and the cars parked or garaged in separate groups. It is probable, however, that motorists will prefer to have their cars adjoining their cabins, if only to simplify loading and unloading luggage.

More elaborate schemes provide not only purely bedroom accommodation but also some sitting- or dining-space. Cooking facilities, when provided for visitors who wish to do their own cooking, are usually grouped with central or communal accommodation. In more expensive schemes, however, in which each unit is completely self-contained, facilities for cooking may be included with those for dining, washing, etc., and sleeping; accommodation of elaborate type involves heavy capital expenditure, especially in regard to water supplies, drainage and similar services. It is probable that those who could afford such facilities in a camp are likely to prefer the amenities of an urban hotel and would be prepared to pay any consequent higher charges. When, however, central restaurant, cooking and toilet facilities are provided, as would appear preferable in order to reduce capital costs, the cabins may be very simple both as regards accommodation and equipment.

Figs. 25, 26, 27 and 28 illustrate various forms of cabin planning where associated space for vehicle parking is provided. If vehicles are left in central car parks. the planning of the cabins follows closely that given for holiday camps, although in motor camps small units, of only a few cabins each, may be preferred. Fig. 26 illustrates a simple form of cabin and car-berth unit. This may be either, as the larger plan, in form of alternative cabins and berths or, as in the smaller plan, semi-detached with a double car berth between each pair; the first scheme is likely to be more popular with car owners and there is less risk of damage to vehicles. The possible saving in space by grouping the cars is small, although the semi-detached cabins may be more economic to build. Semi-detached units are useful for family occupation and this tends to overcome any objections to two vehicles being parked within a common space.

On exposed sites, or in districts of heavy rainfall, it may be desirable to enclose one end of the car berth to eliminate the "flue effect" of the through opening. Car berths should not be less than 10ft. wide in the clear, but, even then, cars must be parked close to one wall to permit the doors to be easily opened. Where two vehicles are parked together, this width may be reduced to 18ft. for the two cars. Roofs should extend on one or both sides to provide at least 16ft. of cover, and even greater widths are desirable. The standing spaces must be hard-surfaced and with slight falls to prevent water collecting on them from driving rain or drainage from surrounding ground. The cabins should be raised slightly above the car spaces and should have a small platform or veranda in front of them to prevent vehicles being placed too near to them.

The cabins shown in Fig. 26 are of minimum size for use by two persons. It is better to equip all cabins with two beds, even if they are only 2ft. 6in. wide, rather than double beds, as this makes the use of the cabins more flexible. In order to economize space in very small cabins, most of the furniture will need to be built-in; it should comprise at least two chairs, a hanging-space or wardrobe, and some shelving, which may serve as a dressing-table and bedside tables. It is better if the cabins are slightly increased from these minimum dimensions to allow for luggage stands, or at least space for luggage, movable chairs and some drawer-space. If basins are to be placed in cabins, which is preferable but much more costly than the provision of lavatory blocks, they should be planned in such a position that a service duct may be designed for water pipes and wastes with arrangements for easy access. It is preferable that entrance doors be planned under the cover of the roofs to the car berths so that they allow easy access to the parked vehicles and are sheltered during inclement weather.

Fig. 27 shows a more elaborate type of cabin unit having not only sleeping space but also dining, cooking, and toilet facilities. Such units require considerably more area and the additional depth permits of more adequate housing of the motor car.

Fig. 28 shows a method of planning back-to-back units in order to increase the parking depth. The scheme in the larger plan needs a roadway on one side only and an access pathway on the other frontage. If, however, cabins are planned in groups of four units, as shown in the small plan, a very economical building may be achieved, but then a roadway is necessary on both frontages.

Fig. 25 shows a two-storey scheme in which the living accommodation is planned over the parking space, and is reached by an open-air stair, or, alternatively, as shown in the small plan, two units may be grouped together with a single covered access-stair between them. Units of this type may be very useful on sites with steep falls, as the area to be levelled for each unit of cabin and car park is less.

There are undoubtedly many alternative forms in which cabins of this nature may be planned. These illustrations are typical only.

### Services to Cabins

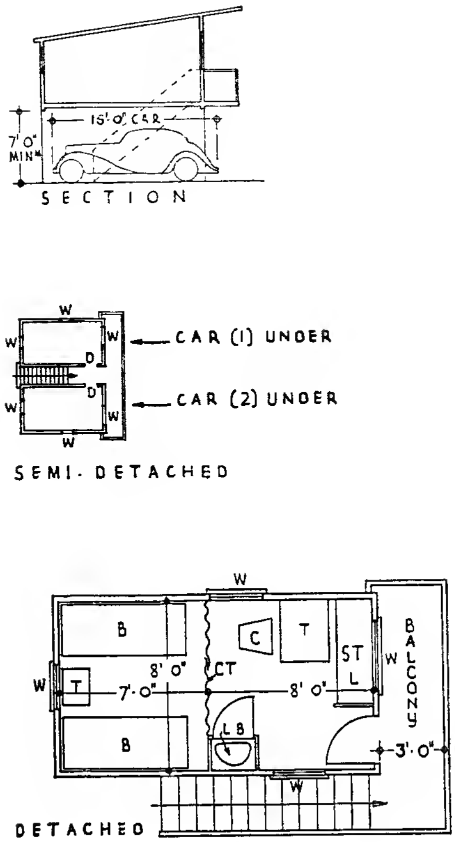
For the cabins of the simpler types without any toilet facilities, the only service needed is electricity for lighting, and power if the cabins are likely to be used during colder seasons. If space-heaters are provided, these might advantageously be controlled by slot-meters. For the more elaborate schemes provision of all services may be necessary.

### Sanitary Accommodation

Except in elaborate schemes it is unlikely that W.C.s will be planned in conjunction with each cabin. Normally they will be planned in blocks associated with groups of sleeping accommodation. The access to the accommodation for each sex should be well separated, although it may be advantageous to plan the whole as a single building. Small groups near the cabins may be preferable to one large building serving the whole camp, although this is more economical, especially when lavatory basins and baths

# *Holiday Hostels and Camps*

## CAMPS FOR MOTORISTS




B = BED OR BUNK
T = TABLE
LB = LAVATORY BASIN
C = CHAIR
ST = SEAT
CT = CURTAIN
D = DOOR
W = WINDOW
L = LOCKER

Fig. 25 Arrangements for cabins

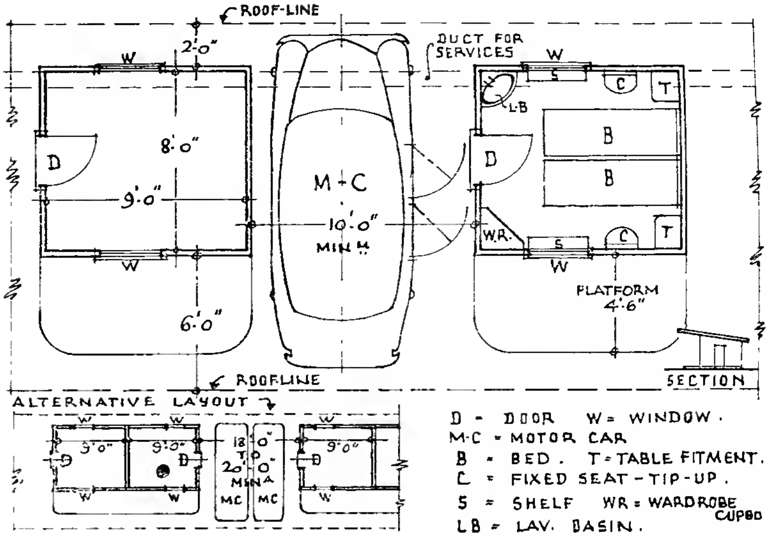
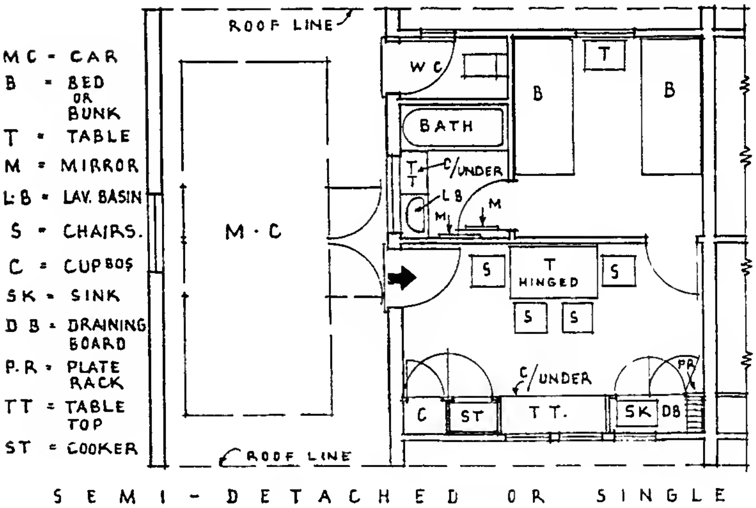
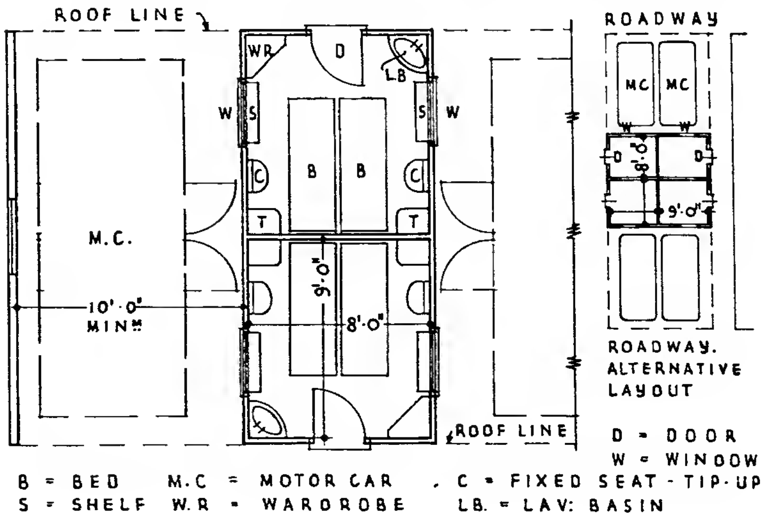



Fig. 26 Alternative arrangements for cabins




Above: Fig. 27 Below: Fig. 28 Alternative arrangements for cabins



are grouped with W.C.s to avoid any plumbing in the cabins.

W.C.s should be provided at the rate of one to ten women and one to 15 men, with the addition of one urinal for every ten men. It may be assumed that the visitors will be equally divided between the sexes. If there is a restaurant catering for outside trade, extra accommodation should be provided, preferably separate from that for the resident visitors and in close proximity to the restaurant.

Lavatory basins may, in the schemes making higher charges, be provided in each cabin; generally it is more economical to group them with W.C.s in sanitary units. It is desirable that hot water should be available; this influences the position of lavatory basins as they should not be too far from the central boilers, unless the units are large enough to have their own heating plant, or are equipped with local gas or electric water-heating. Basins should be provided at a rate of one basin to every six visitors with a few additional fittings for the restaurant.

Tub-baths are likely to be required in small numbers, especially for the use of children and older persons, but shower-baths are sufficient for many visitors. An adequate allowance is two tub-baths and one shower to every 20 women and one tub and two showers for every 20 men. In some schemes the baths are likely to be grouped with the basins and W.C.s and in others they may be planned in the central building, an additional charge being made for their use. In a few elaborate schemes baths may be planned as part of cabin units.

Sanitary accommodation in connection with camp restaurants catering for outside trade should be made on the basis of one W.C. per 15 women, one W.C. per 30 men and one urinal per 20 men. The lavatory for female visitors should have ample table- and mirror-space.

Separate toilet facilities should be provided for each type of staff, e.g., the manager, kitchen, restaurant and general service and should be planned in association with their working accommodation in the central building and/or attached to their sleeping quarters.

Fig. 29 illustrates examples of accommodation for men and women based on approximately 20 of each sex. It should be noted that the basins to be used by women are planned in separate cubicles each about 5ft. by 3ft., but for men they are in an open room. As the W.C.s and urinals are likely to be most used and the baths least used this should be borne in mind in their relationship to the entrance to the block and in the separation of the various types of accommodation into individual blocks placed at varying distances from cabins.

### Central Buildings

The main accommodation to be grouped together in a central building is the restaurant, kitchen and associated storage, visitors' kitchen—if provided—possibly visitors' baths and toilet facilities, manager's office, manager's quarters, staff quarters for unmarried staff, boiler room, fuel and other storage space and possibly a small retail shop. It may also be desirable to provide a lounge for visitors which can also serve for communal activities such as dances, sing-songs and the like. Associated with, but separate from, the central building there may also be a petrol station and repair facilities.

The siting of the central buildings should be convenient to the visitors' cabins, especially if cooking facilities for visitors are provided. If there is a restaurant serving outside trade it should be so planned that its customers can be accommodated separately from the resident visitors.

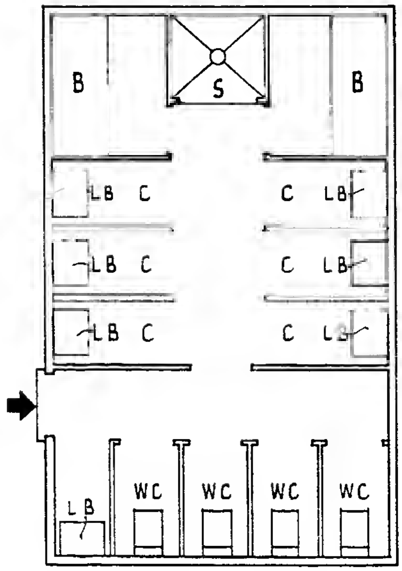
### The Restaurant

If the restaurant is to be used for both residents and casual visitors it may be desirable to plan it in two parts; this has the added advantage that if the numbers are, in any way, seasonal and widely varying one room may be closed, giving a more comfortable appearance. The restaurant should be planned on the basis of small tables for two and four persons which can be put together for larger parties. The general planning of restaurant and associated kitchens should follow that given in the section " Hotels."

### Kitchens and Food Storage

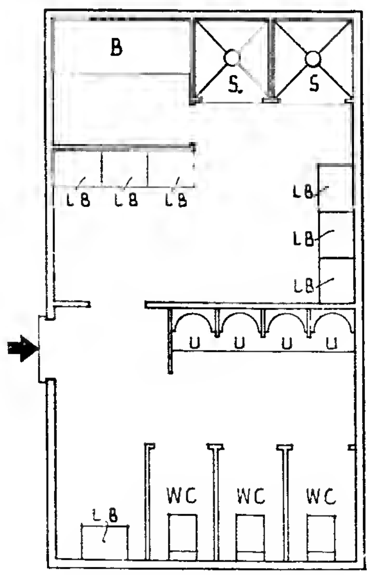
The kitchens serving the restaurant and the staff should be separate from the cooking facilities provided for visitors' own use. All kitchens should adjoin a restaurant and have all types of storage immediately adjoining.

Since these camps are likely to be, in many schemes, far away from shopping-centres, stores may need to be specially large in capacity, especially in regard to dry storage and refrigerated space.




SANITARY UNIT
WOMEN

KEY
B—bath
LB—lavatory basin
C—cubicle
S—shower
U—urinal




SANITARY UNIT
MEN

Fig. 29 Sanitary accomodation: examples are for 20 persons approximately

Information on the planning of kitchens is given in the section " Hotels."

**Visitors' Cooking Facilities**

If not provided in each cabin, cooking facilities should be planned as part of the central buildings and should comprise one large room with a series of small larder-lockers attached. Hot water should be available. A series of units should be planned around the walls, each consisting of some form of simple cooker, preferably electric or gas, with fixed table-space adjoining. The cookers may with advantage be of the table-top type as ovens are not often required. There should be ample cupboard-space for utensils, china and glass. Cookers should be planned at approximately 4ft. centres and should be provided at a rate of one to each six cabins. Sinks of a normal domestic type about 24in. by 18in. should be provided at a rate of one for every two cookers and should be given at least 30in. of draining-board space on each side. The sinks should be kept together in one part (or the centre) of the room so that those using them are not in the way of others cooking, and also to simplify plumbing. Ample daylight should be planned for all kitchens, with good cross-ventilation. Good artificial lighting is also necessary as the kitchens may be used to the maximum during the evening. Ventilated food lockers should be provided at a rate of one to each cabin. If, however, central cooking facilities are also provided and operated by a staff, or if there is a restaurant where visitors may obtain ready-cooked meals, the visitors' own cooking facilities and food storage may be reduced from the suggested requirements already given.

In the more elaborate types of cabin in which individual cooking facilities are provided, the equipment should comprise a similar small cooker, a small sink with drainboard, a ventilated food locker and sufficient cupboard space for china, glass and utensils for at least two persons. *See* under " Holiday Hostels."

Trailer-caravan camps do not need normally to have cooking facilities, as the caravans are generally fully equipped for this purpose. Tented camps may, however, need a central kitchen for visitors' own use similar to that for cabin-type camps. Facilities may also be desired for open-air cooking when concrete hearths with dwarf walls to act as wind-breaks are desirable to reduce the fire risk to the tents and surrounding land. If taps, are provided for water supply in the open air, provision for drainage of any overflow water and of dripping taps is essential.

**Manager's Office**

This should be planned in a central position in the central building, adjoining the entrance hall and thus immediately obvious on entering the building. It should be a room at least 120sq. ft. in area with space for a desk and two or three chairs, filing space and cupboards. An inquiry hatch might communicate with the hall, to act as the reception counter, when the camp is a small one.

**Manager's Quarters**

The manager is likely to be married and the quarters should be planned on this basis. A private sitting-room might adjoin the office and this should have good access to the kitchen. The bedroom accommodation might usefully be placed on an upper floor and should have at least one double bedroom and possibly one additional single room for a child or guest.

**Storage**

It is important to provide ample storage and drying space for linen, blankets, mattresses and spare furniture: if cabins are not heated in off-seasons all equipment must be kept dry and aired.

**Lounge**

Whenever a camp has central buildings, the latter should have a lounge or common room for social use in the evening and on wet days. It should be based on providing about 10sq. ft. per head (visitors' bed-numbers) of the whole camp. A small platform at one end is advantageous. In those camps which do not have a restaurant the room may also be used as the dining-room and it must then be planned in close association with the visitors' kitchen and the central kitchen if meals prepared by staff are made available. If camps are to be used in colder weather heating facilities are essential, but if not used in the full winter season a large open fire or openable stove is sufficient. It is preferable if common rooms are rectangular rather than square, have french doors on to a terrace or garden, face south-westwards and have the benefit of an open view.

**Bars, etc.**

If the camps are to act as regular stopping-places for long-distance bus services a licence for the sale of alcoholic drinks may be required. This will have some influence on the planning, as suitable storage and service accommodation will be required. It is unlikely that a bar will be provided but, as in many hotels, alcohol will be supplied only in common rooms such as lounges or with meals.

Camps catering entirely for residents, i.e., those spending one or more nights, might occasionally seek a club licence without requiring a normal licence.

**Shop**

Facilities attached to or forming part of the manager's office for the purchase of stationery, sweets and tobacco are needed at all camps, and when visitors cater for themselves it may also be necessary to sell some food supplies. If the latter is the case, well-ventilated cool cupboards are needed for the storage of dry goods and tinned food and it may also be desirable to provide space for a large refrigerator for keeping the more perishable foods and frozen foods.

**Staff Quarters**

A number of single rooms, each at least 70sq. ft. in area, is needed in two groups for male and female staff respectively. The staff is likely to be small if visitors do their own catering, but if a restaurant is provided the number of staff will increase considerably. A factor affecting the amount of staff accommodation is the proximity of the nearest town or village; if this is far away almost all the staff will need to be housed on the site. Some small houses for married staff may also be needed, especially for those who reside on or near the site throughout the year, such as gardeners and service-station staff. If the staff is large a staff common room should be provided. Staff rooms may with advantage be planned on an upper floor of the central building.

### Introduction

This section is concerned with data and details of planning for motor vehicles. It is divided into three parts: Public Service Vehicles, Public Garages and Filling Stations.

There are several Acts of Parliament and a considerable number of statutory regulations and orders which set out specific requirements as to vehicle sizes and as to storage of petroleum and these have direct bearing on the design of buildings and layout connected with motor vehicles. The most important of these publications are: the Petroleum (Consolidation) Act, 1928, Statutory Rules and Orders, 1929, No. 952, Petroleum, etc., and the Road Traffic Acts of 1930 and 1934, with amendments thereto and subsequent regulations issued under the Acts, made by the Minister of Transport. The first and second of these deal, as far as buildings are concerned, with storage and sale of petroleum. A licence is required for the storage of petroleum spirit if more than three gallons is stored and if it is in containers exceeding one pint each.

It is required that petroleum spirit shall be kept in metal containers and the storage space, unless in the open air, must have direct access from the open air. Proper and suitable fire-extinguishers must be kept in or very near the storage place. The storage place shall not form part of or be attached to any dwelling or place where persons assemble for any purpose, unless it is separated by a substantial floor or partition which is constructed of fire-resisting materials and is without openings. The storage place must not be under staircases or other means of exit likely to be used in case of fire unless separated by fire-resisting materials. The Petroleum Act, 1928, also provides for control of the sale of petrol by means of by-laws to be made by local authorities, who are empowered to issue the necessary licences for its sale.

In areas where amenities enjoyed by the public such as scenery, places of historical interest, etc., might be impaired, the design of the buildings and the style of lettering may be controlled and even the establishment of a filling station may be prohibited. The Act also prohibits the emptying in any way whatsoever of petroleum spirit into sewers or drains connected to sewers.

### Sizes and Turning Circles of Vehicles

Data concerning the dimensions of vehicles are given in Part 1: Transport.

### Definition of a Public Service Vehicle

For the present purpose the term "Public-service Vehicle" (P.S.V.) should be taken as referring to motor buses, motor coaches and taxis, but not to motor-cars which are used for private hire.

Officially the term is used to denote a motor vehicle which is used for carrying passengers for hire or reward, but it excludes "contract carriages" having less than eight seats, trams and trolley buses.

A motor bus is usually classified as a "stage carriage" and a long-distance coach as an "express carriage."

### Bus Stations

The bus station which is specially planned is a relatively new development brought about by a general increase in public-service traffic. Its provision is also due to the desire to increase public safety by the reduction of obstructions in streets and to avoid traffic delays arising from vehicles stopping to pick up and set down passengers, change crews, etc., in any but recognized and authorized locations. It is probable that fuller planned bus-station facilities will be regarded as a necessity in all urban areas in the near future.

It cannot be stressed too strongly from the initial conception of any scheme that bus stations may be concerned with the operation of both local and long-distance services and in some areas also with sight-seeing and similar tourist traffic. The latter may occur not only in seaside and similar holiday resorts, but in towns possessing historical and architectural interest and beauty which must be preserved, not marred, by provision of public-service vehicle facilities.

### Sites

For local services and those serving small towns and villages in the locality, it is desirable that the site for a bus station be found within 400yds. to 500yds. of the main shopping and commercial centres of the town. Wherever possible bus stations should be close also to the main railway station, although it is realized that this full combination of shops and stations may not always be possible.

Bus stations should not be planned near dwellings, churches or schools as the noise can be a considerable source of annoyance and discomfort to the occupiers, especially during the early or late hours of the day.

Close proximity to shopping centres is of less importance for stations concerned with long-distance express services.

The areas required for bus-station sites are entirely dependent on the various local circumstances which will dictate the volume and frequency of traffic. However, as it would seem that the use of buses is constantly increasing, ample sites should be sought at the commencement of any scheme, if only to meet the possibility of the future extensions required for more frequent buses or the establishment of new services. Unless some such policy is pursued it may mean that an urban bus station may have to be moved to a new or larger site or have to be duplicated elsewhere purely as a result of demand.

Site areas again are affected by the need to meet peak-traffic loads on market or on special mid-week shopping days. Through services may make smaller demands for site area, especially if they are well spread out throughout the day. If, however, many such services arrive or leave about the same time and form connecting services, much more standing-space may be necessary. Terminal stations involving long waits for vehicles will also need large areas especially set aside for parking.

An important planning-factor in the selection of a site is its relationship to the roads and traffic flow of the surrounding area. The concentration of vehicles using the station must not impede normal street traffic or in any way increase danger for any other road user, vehicular or pedestrian.

Where traffic is not heavy, bus stations may be provided by acquiring land suitable for the planning and construction of what amounts to a wide private street with one-way or straight-through traffic. In towns with more frequent P.S.V. traffic, much more

elaborate station schemes naturally become necessary, and will affect larger areas of the urban layout around the actual station site.

In smaller towns it may be possible to provide bus-station facilities by widening a portion of a main street, if the number of vehicles is small and few stop for long or at any one time. Such a scheme should not cause cross-traffic; widenings, therefore, are usually needed on both sides of the street, although possibly not exactly opposite one another.

Fig. 1 illustrates the essential widening of a roadway to provide a bus stopping-place which will not interfere with the normal traffic flow of the street. Such a layout requires a set-back in the road width of 9ft. and preferably up to 10ft.; it is also important that there should be no reduction but, if possible, an increase in the pavement width in order to allow for covered waiting-space for queues and to avoid pedestrian congestion.

The length required for this type of vehicle bay is based on the number of vehicles likely to use the stop at any time; the allowance should be at least 45ft. per vehicle, with a minimum of 100ft. As shown on the figure these dimensions will allow each vehicle to move away into the main traffic flow without moving any other vehicle in the bay.

Fig. 2 illustrates two examples of the "private-street" type of stopping-place or station. In each example the length can be anything needed to provide standing-places for the anticipated number of vehicles and waiting passengers. Congestion at the ends where junctions with the main roads occur may become serious, however, if any P.S.V.s are to be catered for within such a scheme. If adjoining space, more than is required for the traffic-ways and the passenger queuing-spaces, is acquired, other and more complete bus-station facilities can be provided on one or both sides of the road, in either of the two examples. Scheme A is planned for vehicles to wait on one side of the street only and consequently involves one-way traffic and requires, in addition, suitable roadway layout and traffic conditions in the surrounding streets, a circumstance which may not always be found. Both examples require that the streets at each end do not carry very heavy traffic, as "cross-overs" are involved, through buses entering and leaving the station to go in any direction in the main street, and these may cause serious intermittent delays. Scheme B makes provision for traffic in both directions and the roadway, therefore, provides for four separate traffic-lanes. At each out-going end the corner buildings must be designed so that proper vision is possible of the traffic using the street to be entered.

It is almost essential that schemes of this type should not be used also by ordinary traffic.

Schemes based on Type B are apt to cause inconvenience to strangers using the station, as they may not know from which stance a bus is leaving and may therefore need to cross busy traffic-ways quickly.

The layout shown in Fig. 3 has a central concourse around which all the bus stances are planned. The traffic proceeds in a one-way direction round the central unit. The central unit allows concentration of all passenger facilities in one unit of building. If the roads of such a scheme are used for normal traffic, in addition to the bus traffic, bridges or subways for access to the central concourse are likely to be needed.

The openings in the passenger guard-rails will have to be related closely to the position of entrances to the vehicles using each stance; or, alternatively, the guard-rails must be adjustable or movable. It should be noted that the width of traffic-ways influences the spacing of the bus stances, as shown in Fig. 3: if roads are only 20ft. wide, an additional length of 5ft. over the minimum of 45ft. will be needed for vehicles to enter and leave stances without disturbing adjoining vehicles in the process.

Fig. 4 illustrates a type of bus station with a large open standing-space, slightly raised passenger waiting-spaces or platforms and a concourse and booking-unit on one side. The scheme is based on a single entry; normal road traffic can be taken, however, through the scheme if extra roadway widths are provided as shown on the left and top of the plan. As the layout is based on one-way traffic the platforms or passenger waiting-spaces need to be at least 20ft. apart and are used on one side only for access to vehicles. Provision is made for through services to stop on the left and top sides of the scheme, leaving the central platforms free for vehicles which may wait for longer periods.

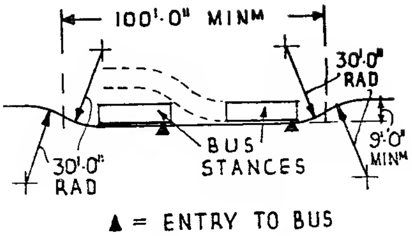
The concourse is planned on a normal street frontage.

If schemes of this type are adopted it will probably be found to be uneconomical to roof the whole area. Covering may be provided over the platforms to protect the passengers, although such roofs are apt to be unsatisfactory in driving rain. This scheme is based on a one-way entrance but it should be noted that it has exits in three directions.

It will be seen that in the schemes shown in Figs. 1, 2 and 3 vehicles drive through, and do not have to back into or out of a stance either on arrival or departure. The lengths of the stances, however, must be based on maximum vehicle lengths with an additional allowance for entering or leaving without disturbance of other vehicles; these lengths may involve very large site areas for the larger stations. Such sites may not always be available and an alternative layout shown in later diagrams may become necessary.

Schemes involving backing in or out of stances, although more economical in site area, can be more troublesome in operation and tend to slow up the handling of vehicles, especially in peak periods.

Fig. 5 illustrates a smaller type of bus station formed by making a set-back in a street frontage into which the vehicles are turned. The whole area may be covered. The need in such plans to back vehicles at some stage may cause traffic inconvenience in the main roads. This may be reduced if the road width is increased to form an unloading stance on the lines of that indicated in Fig. 1. The differences between Schemes A and B is, that in the former the vehicles back in after driving past the stance, and in the latter drive straight into the stance and then back out to leave. In layouts of this type vehicle stances should be based on 13-ft. centres to provide a minimum of 5ft. between standing vehicles. The set-back of the pavement or platform needs to be such that the roof will provide cover to entrances placed near the front of vehicles. The planning of the stances at an angle, as shown, facilitates driving in or out and occupies far less space than parking at right angles to the main traffic routes.




Above: Fig. 1 Road widening for bus stops

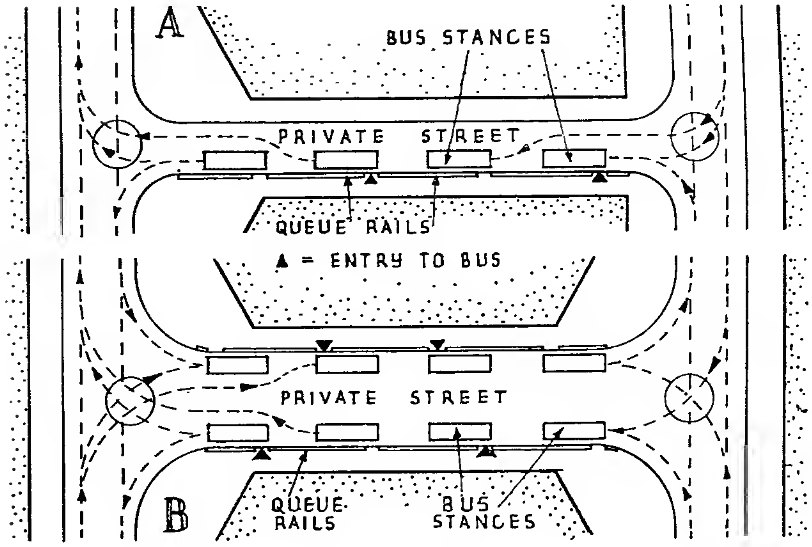



Fig. 2 Bus stations: "private street"

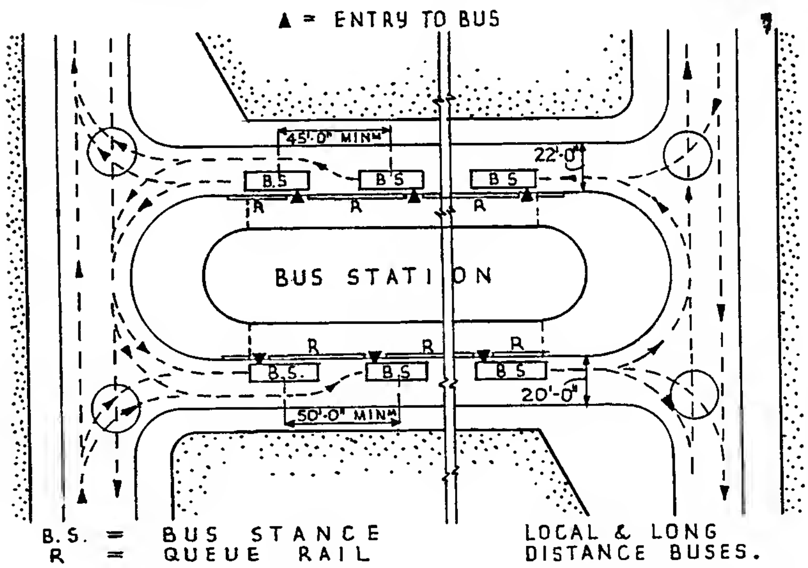
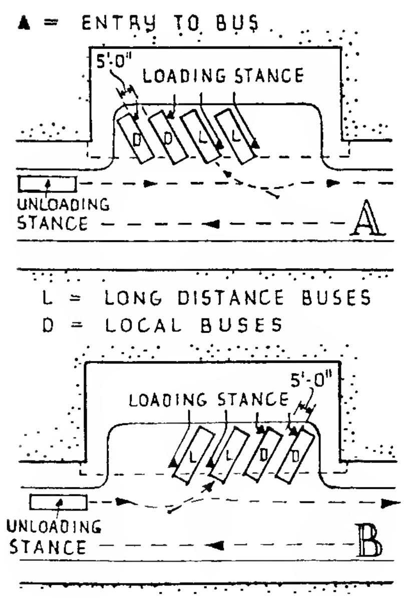
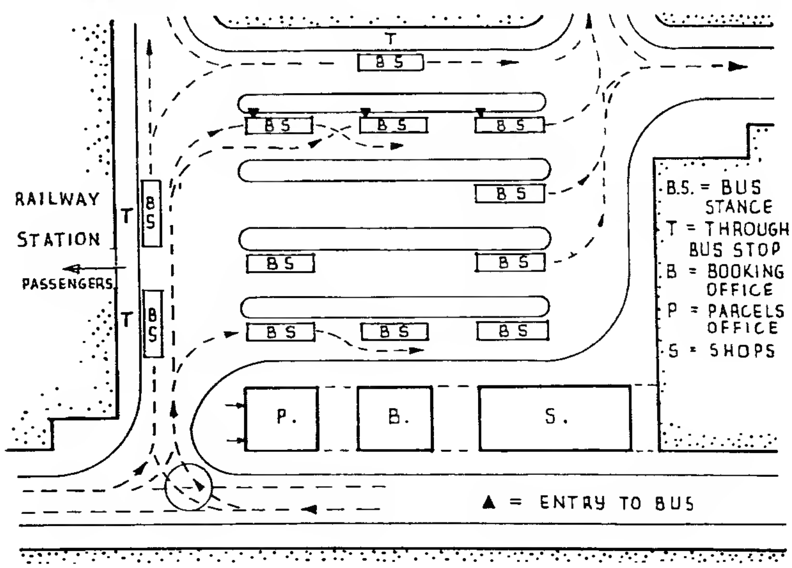



Fig. 3 Bus stations: "central concourse"




Above: Fig. 5 Bus stations: "small set-backs"




Right: Fig. 4 Bus stations: "open standing"

Fig. 6 shows three variations of a typical layout which is economic on street frontage and makes good use of a deep site. A central concourse is shown directly entered from the main street footway; at the same time a part of the frontage may be used for shops in the one position on the site which would carry the highest rental values. Round this concourse is arranged a number of bus stances. To provide the same number of stances in any other way as, for example, that shown in Fig. 4, would involve a much larger site. Each variation shows one-way traffic round the concourse and either backing in or out of the stances, according to whether the vehicle entry is at the front or back of the vehicles. Backing is not so serious a matter within a station used exclusively by buses and coaches as it would be within the confines of a public street or square.

Diagram A, Fig. 6, is for front-entrance vehicles which drive into the stance and back into the traffic-way when leaving.

Diagram B is based on back-entrance vehicles and makes it necessary for the vehicles to back into the stances. Diagram C provides for both front- and back-entrance types by keeping one side of the control unit for each type, for example, local and long-distance.

Developments of the type shown in Fig. 6 can often make good use of any available backland after the necessary number of stances have been provided for, by planning lay-bys for waiting vehicles, repair and servicing spaces and even for covered garaging. The scheme shown provides protective covering for waiting passengers over all entrances to the buses.

Fig. 7 illustrates detailed requirements for the type of bus station shown in Fig. 6. Passenger ways giving access to bus stances should not be less than 6ft. wide; if there are doors dividing concourse from platforms, desirable for comfort in bad weather, this minimum width of 6ft. should be increased by the amount of the doorswing. Any supports needed for roofs, upper stories or marquises projecting over the platforms are best and more safely placed as indicated on the plan, since in this position the least obstruction is created, both for the pedestrians and for the vehicles themselves.

The width of the bay at the end of the vehicle stance should be at least 11ft. in order to provide not less than 3ft. clear space between adjacent buses having the maximum permitted width of 8ft. In order that platform spaces may be protected as far as possible from rain, it is desirable to provide cover at least up to the line of the bus entry, as indicated on the diagram. The effective protection will be improved if the covering, whether roof, marquise or upper floor, is extended further as indicated.

A similar arrangement is possible for vehicles having front entry and the alternative conditions are indicated in Fig. 6.

It will be noted on the diagrammatic section included in Fig. 7 that platform heights are indicated to a maximum of 6in.; this will correspond with normal kerb heights of footpaths above traffic ways, as it should be remembered that bus stops are designed in order to fit this height.

All roofs or marquises should be designed to provide a clear height of 15ft. 6in. above the level of the roadway; this height may be reduced if it is certain that only single-deck vehicles will ever be used.

If vehicles are to be backed into specially shaped platforms (as in Fig. 6) wheel-stops should be provided to avoid damage to coach-work. The positions of these stops may, however, need to be altered from time to time as the design of vehicles changes and to make the stops adjustable should present little difficulty.

Fig. 8, Diagram A, illustrates a further type of bus station in which all movement of vehicles takes place in the centre and the passenger facilities are provided round the outside. As in the type shown in Fig. 6, this scheme requires vehicles to be backed either in or out of stances; to do this is somewhat difficult and may be even very inconvenient in rush periods owing to the probability that the central turning-space is likely to be relatively small and crowded; this central space cannot in any case be less than 100ft. across.

The arrangement of passenger accommodation round the perimeter has, however, its advantages; the most important ones are that passengers need never cross traffic-ways to reach a bus and passengers are also well protected while waiting for a vehicle. Additional staff or passenger accommodation may be planned both over the bus stances and the general entrance and concourse accommodation; the whole layout provides ample opportunity for good lighting and also for good ventilation to the open air.

Fig. 8, Diagrams B and C, shows alternative platform arrangements for the "perimeter" type of station. Type B is based on berthing the bus bonnet inwards, and here either front- or back-entry types can be accommodated in every berth. Type C, however, provides only for rear-entry types and the vehicles must be backed into the stance, an operation difficult to achieve satisfactorily. This type of " closed berth " must be at least 9ft. wide, even though the buses are only 7ft. 6in., or at the most, 8ft. wide, to give reasonable latitude for the manipulation of the vehicles. The main perimeter circulation-space for passengers should never be less than 10ft. wide and the platform bays for access to vehicles should not be less than 9ft. wide.

Guard-rails may be provided, or alternatively the passenger bays may be partially closed (or screened) and roofed as suggested in the Diagrams A and B in Fig. 8.

The scheme shown in Fig. 8 may be used on any site which has one suitable street frontage (for example, that at the top of the diagram) and need not be an island site as shown. The suggested passenger entrance from a main street may be advantageous, as indicated, as it can be planned together with the suggested taxi facilities; the latter are often needed if long-distance services use the station. It is obvious also that any island site may assist in achieving better circulation of vehicles to and from the station and ease traffic congestion in streets adjoining the station.

The spaces needed for drawing out buses from station or parking stances are shown, for the two commonest conditions, in Fig. 9. It will be seen that the 45° stances allow for roads of considerably less width, an important consideration where site-space is limited.

**Passenger Facilities**

In addition to the stances and the space required for the movement of vehicles, facilities must be provided for the use of passengers and staff.

Passengers need queueing space, waiting rooms, a booking-office where

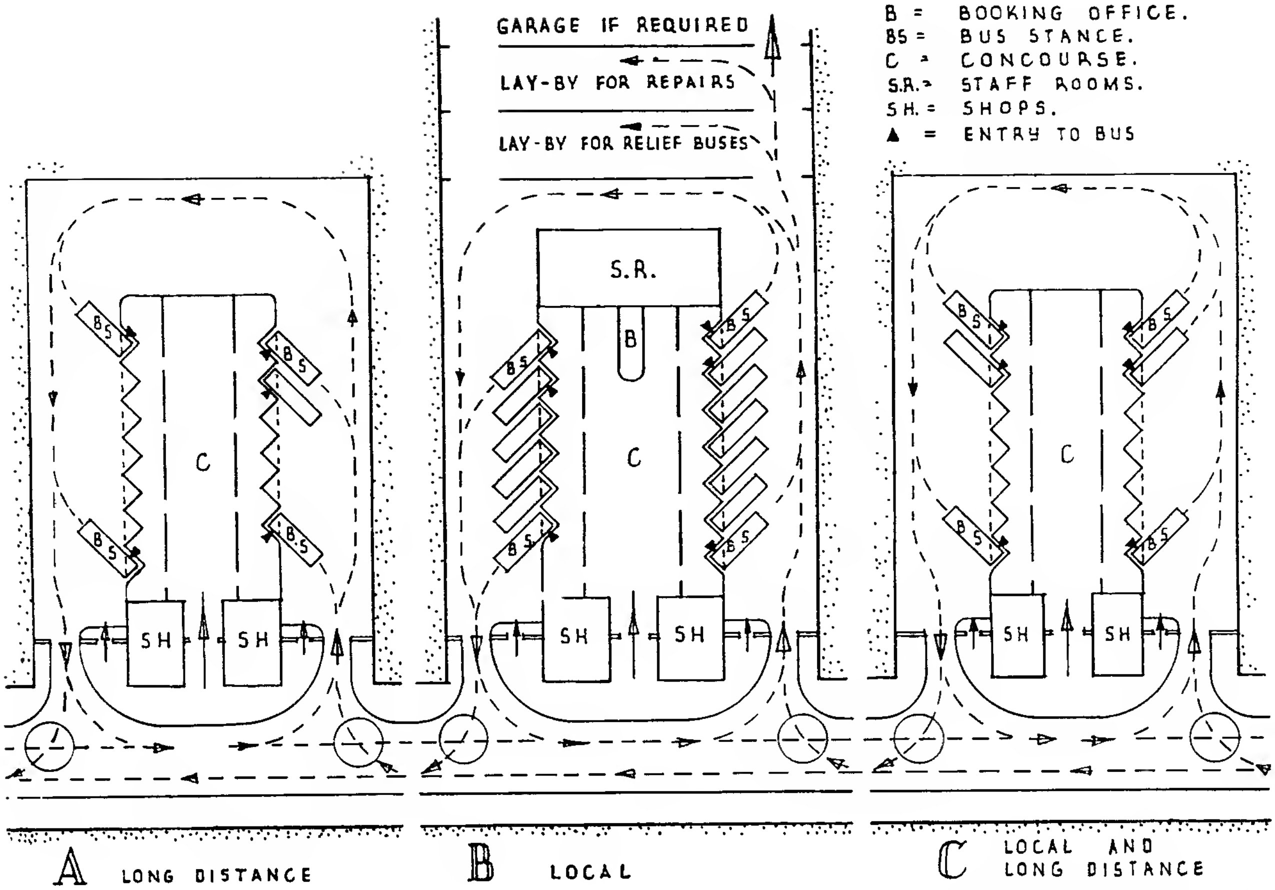



Fig. 6 Alternative bus stations

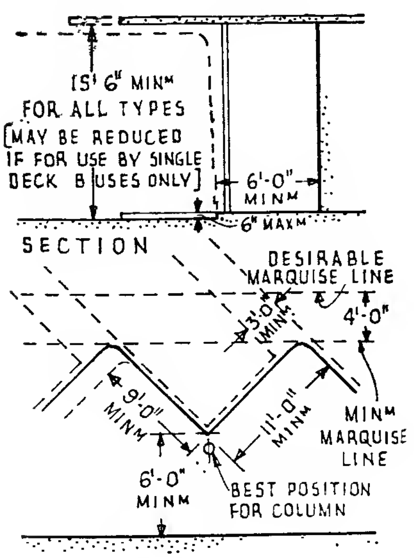



Fig. 7 Passenger ways

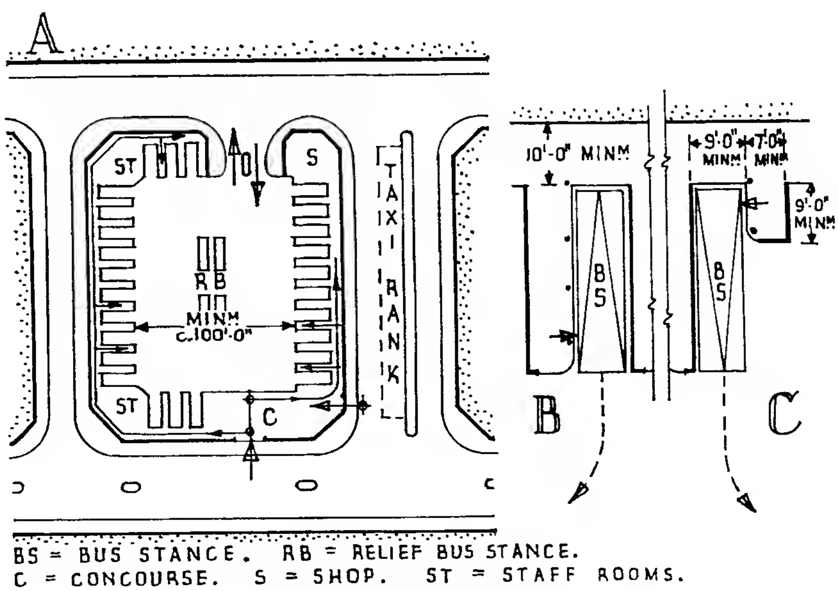



Fig. 8 Alternative bus station and platform arrangements

long-distance services are involved, an inquiry office, left-luggage room, parcel office, and sanitary accommodation for both sexes. Often shops or kiosks for papers, tobacco, etc., and in many schemes light refreshment facilities also are required. These additional elements may have to be planned so that they may be let to separate tenants as concessions rather than operated by the bus company; in either case the use of space for such purposes helps to reduce the overhead or running costs of the bus station and is obviously of assistance to and therefore popular with, passengers. (*See* Fig. 10 for general analysis of essential station accommodation.)

### Passenger Waiting-space

There are advantages in planning passenger arrivals in positions well away from queues of passengers waiting to be picked up, mainly to avoid congestion and confusion. Several of the figures have indicated separate setting-down positions.

Difficulties for casual users may, however, arise if departures are from two sides of a parking area as shown in Figs. 2, 3 and 6 as any of these examples may necessitate crossing lines of moving traffic or passenger queues in addition to parked vehicles. Central waiting, as shown in Fig. 6, or a continuous perimeter platform as shown in Fig. 8, is, therefore, probably the best arrangement wherever the size of the station justifies such layouts.

Stations which are entirely enclosed from the weather are obviously to be preferred but may be difficult and costly to provide. Roofed spaces unenclosed or only partially enclosed on the sides are apt to be very draughty. Roofed shelters over narrow queueing-spaces or platforms can be dry only if enclosed or screened with the necessary entrances and exits properly planned.

The type of shelter which seems generally preferable is one which is parallel to the traffic-ways (*see* Figs. 11 and 12); unless the whole station is based on a central and covered concourse as shown in Fig. 6.

The problem of providing accommodation for waiting passengers satisfactorily is an exceedingly difficult one. Many schemes have been tried but all seem to have greater or lesser disadvantages. Standing queues are suitable for all healthy people but are very unsatisfactory for old or infirm persons and for mothers with young children unless associated seating can be provided. It is almost impossible to provide seating for all, even in " off-peak " periods, nor would all use it if provided. Priority arises between those standing, those seated, and those who wait in a waiting-space or room. Difficulties also arise with variations in length of wait for a particular bus service. It has been suggested and in fact tried out abroad, that tear-off numbered slips should be taken in turn by each passenger arriving at the queue or waiting-space, so that priority is established and, to some extent, queues avoided.

In all stations, except those catering only for very frequent local services, some type of waiting room or concourse is essential. The waiting-space, of whatever type, should be spread out, if there are many routes to be served; although, if all are long-distance services, the problem becomes similar to that of a railway station, where queue spaces at various points and a number of small waiting rooms may be preferable to one large room.

Waiting-spaces should be based on peak loads which may arise on market days or at holiday periods, but may have to exclude exceptional loads occurring for example, on Bank Holidays.

Seating should be based on an allowance of 21in. run per person. It is best of an open slatted type; the underseat space should be kept as clear as possible for easy cleaning.

### Booking and Inquiries

Of the essential passenger facilities the booking-office should be the most prominent. Its position must be immediately obvious from whatever direction passengers may approach. It should be independent of, and, in fact, well away from waiting rooms and similar accommodation; where there is a central concourse it should form an important part of it. Booking-offices are not usually necessary for local services, but most express services arrange that passengers book and pay for seats prior to the commencement of a journey, as even if there is a conductor on the vehicle, money is not taken *en route*. Similarly sight-seeing and similar trips are pre-booked. Stations catering for these latter types of traffic need considerable space on both sides of the counter; for passengers waiting to book and making inquiries and on the staff side for working-space, charts, timetables, tickets and cash.

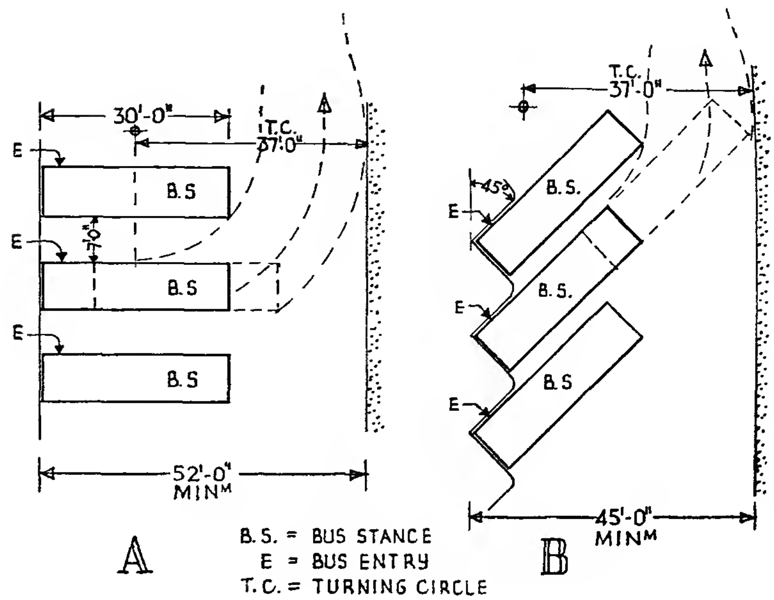
The essential element of an inquiry office is an ample counter to allow for an adequate number of clerks working at the same time, based on the needs of an average demand. Counters with an allowance of at least 5ft. run of serving space per clerk, are usually adequate for all purposes. Counters should be planned with adequate space between them and all entrance and exit doors so that inquirers and their luggage do not impede normal circulations to and from the bus stances. Booking and inquiry offices should be under cover, i.e., indoors, not merely hatches in external walls. At least 50sq. ft. of passenger space is necessary to each clerk's space.

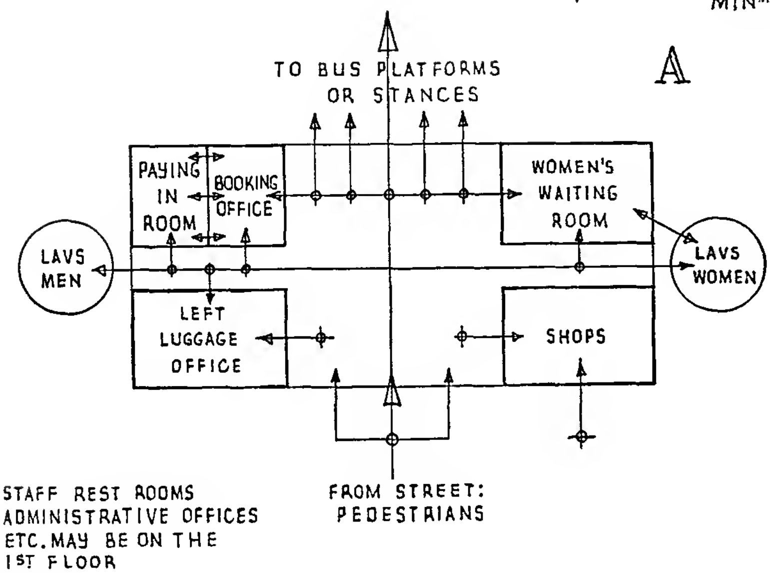
Counters for inquiries or bookings should be 3ft. 6in. high and 18in. wide for inquiries and 2ft. wide for booking. The space behind the counter need not be wide unless it is also used as general office space; the latter arrangement is generally undesirable as office workers are less disturbed if provided with separate offices, possibly approached by doors from the clerk's space. It should be noted that passengers often take longer at booking-counters than at inquiry counters and the clerk's spaces and circulations should be planned accordingly. There should be plenty of wall space in all public spaces for orderly and well-planned displays of posters, timetables and notices.

### Left-luggage Office

Facilities should be provided at all bus stations for left luggage and parcels. Normally most of the articles are reclaimed within a few hours and very few remain for more than 24 hours. Articles may be left for longer periods and unclaimed articles have to be kept for several months; space should be allotted accordingly. A lost-property office is necessary and is usually associated with left-luggage facilities. Left-luggage offices are generally equipped with a counter to divide passenger space from storage- and working-spaces. This counter need only be 18in. to 24in. high, as all luggage has to be lifted on to and over the counter.

Right: Fig. 9 Parking roads




Left: Fig. 10 Analysis of essential bus-station accommodation

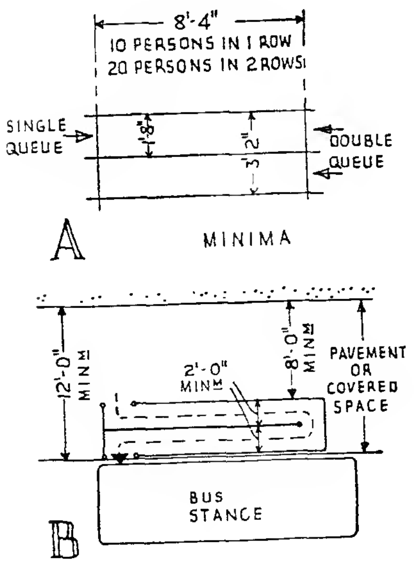



Fig. 11 Bus queues

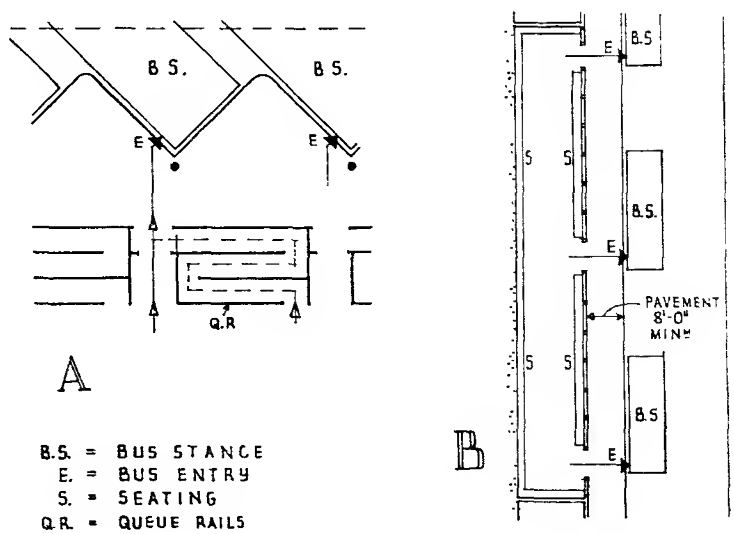



Fig. 12 Under-cover bus queues

# Garages and Parking Spaces

## PUBLIC SERVICE VEHICLES

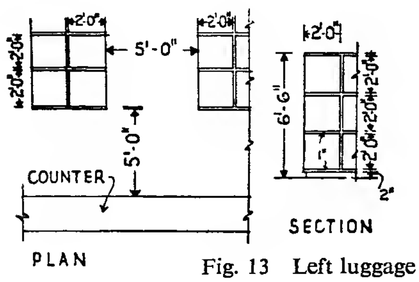



Fig. 13 Left luggage

Though the counter length may be short (one or two clerks only) there should be plenty of passenger waiting-space adjoining the counter. It should be borne in mind that bus passengers generally have less bulky luggage than railway passengers; the most common article is the suitcase with a maximum size of 24in. long × 15in. high × 7in. wide and most of the storage racking should provide all-purpose racking in multiple units of 24in. × 24in. × 24in. (*see* Fig. 13).

A clerk's desk is needed for making out the passengers' checks for goods handed in. Luggage offices in large stations sometimes have separate incoming and out-going traffic.

Parcel offices are often needed, either associated with left luggage or as a separate unit, as many bus companies undertake the delivery of parcels on rural routes. Mostly such parcels are of relatively small dimensions and light weight but racking needs to be based on keeping parcels for each route together. Parcel offices need space for a weighing machine and desk space for the clerks in addition to the counters. Counters should be at least 18in. wide and preferably 24in.

Luggage and parcel offices must be kept dry and reasonably warm in winter but not enough to damage perishable contents of parcels (56° to 60°).

### Indicators

An important aid for passengers is efficient, clear and distinct indication of when and where departures of vehicles will take place. Berths or stances should be clearly marked with numbers; detailed destination boards are also desirable. All important signs should be illuminated at night.

It is becoming usual at all large stations, to install a loud-speaker system for the direction of passengers. The loud-speakers should be placed very carefully in relation to the queue and waiting-spaces so that audibility is not too much affected by engine noises. The controls should be placed in the inspector's or controller's office.

### General Equipment

Stations should be adequately equipped with rubbish bins and baskets in or adjoining waiting rooms and queueing-spaces. Drinking-fountains should also be provided. A service room with sink facilities for filling and emptying buckets, racks for brooms, etc., is essential for cleaners of both the buildings and open yards.

### Artificial Lighting

It is most important for bus stations to be well lighted in all parts used by passengers and vehicles but care must be taken that lights do not shine in the eyes of drivers. Internal lights should be screened from yards, and yard lights should be installed at least 15ft. above roadway level.

At busy stations " in " and " out " ways into public streets may have to be controlled by traffic-signal lights. If these are installed careful placing is required to avoid, for normal road users, the possibility of confusion with any adjacent public street traffic-lights.

### Internal Roadways

Roadways should be as level as possible excepting for the falls needed to provide quick drainage of all surfaces. Steep cambers towards kerbs or platforms should be avoided, to reduce the risk of vehicles sliding or skidding toward the kerb. A camber of 1 in 40 should be the maximum and it is better to make the surface fall away from kerbs and platforms used by passengers. Road surfaces should be selected to provide a non-skid surface which will not be affected by oil patches. Where falls along kerbs or platforms are necessary these should be so arranged that kerbs are an average of 6in. high and not less than 4in. or more than 8in.

### Lavatories

All bus stations, regardless of size, should provide sanitary accommodation for male and female passengers. The details of planning have already been given in Part 1: Sanitation. Lavatories in bus stations should, if possible, be planned on the same level as the platforms and in fairly close association with passengers' waiting-spaces. At stations used by long-distance express services, washing facilities may be required for both sexes.

Lavatories should be readily accessible also from the bus stances. Separate accommodation for passengers and staff should be planned.

### Cafés and Restaurants

Facilities at least for light refreshments are desirable at all bus stations except for those catering only for very local traffic. Where the station is a stopping- and inter-change station for long-distance services, the service of main meals may be necessary, and in these cases self-service or waitress-service at tables is desirable. Counter-service is becoming more generally acceptable, but where it is adopted consideration must be given to the fact that many customers have luggage or parcels which they wish to keep near them during a meal.

Details of the planning of restaurants and counter-service are given in the sections on " Hotels," " Holiday Camps " and " Shops."

### Kiosks and Shops

Shops, or more frequently, kiosks are desirable for the sale of newspapers and magazines, sweets and confectionery and also for tobacco. They are often leased as concessions rather than operated by the bus company. Whenever there is a suitable street-frontage as much of the adjacent ground-floor area and frontage as possible should be used for shops. It is wise to ensure that the selling-space is indoors, or at least under very adequate cover, as a protection from rain and wind, for both passengers and the goods on open-fronted stalls or kiosks.

Very small kiosks or stalls usually require additional space for some bulk storage in positions reasonably accessible to the selling space.

The essential needs of these kiosks are: a counter (which may include a flap

or wicket gate for access), shelving, some storage and as much display space as possible. Shutters or gates are necessary to secure the stalls or kiosks when required. No separate sanitary facilities are needed as shop staff usually use the general station accommodation or that of the station staff. Kiosks can be as little as 4ft. wide and 5ft. deep but more space is obviously desirable.

### Staff Accommodation

The staff accommodation roughly divides itself into two groups, one needed for the operating of the vehicles and the other for administration. The latter may be of considerable extent if the organization has a head or area office at the station, or quite small if it is only to administer the traffic of the particular station. Offices for administrative staff may, with advantage, occupy upper floors of any station building. The detailed planning should follow the recommendations given in the section on " Office Buildings."

The following accommodation is needed for the operating staff of an average-sized bus station: offices for manager, controller and inspectors; offices for cashiers and ticket clerks; a conductors' paying-in room, locker rooms, sanitary and rest-room accommodation; canteen; storage for staff cycles is needed at many bus stations. Facilities for clocking-on may have to be provided either inside a building or under external cover. Recording clocks should not be installed closer together than 5ft. centre to centre and should be in a position where waiting staff do not impede passenger movements.

Rooms for inspectors and controllers should have good visibility of all the bus stances if this is possible. Some stations have a controller who acts as starter and who is placed in such a position that he overlooks the station from a high level and controls the movements of the buses by light signals, and the passengers by loud-speakers.

The cashiers' room and conductors' paying-in room should adjoin and have connecting hatches for intercommunication. In planning the cashiers' room it must be remembered that there are at times, especially at night, large sums of money in the room; proper provision should be made, therefore, for the safety and storage of cash and, in a measure, for the safety of the cashiers themselves. The cashiers' room should be planned on an allowance of at least 50sq. ft. per person. Paying-in hatches at about 5ft. centre to centre should be provided. Night safes, similar in principle to those used by branch banks are sometimes installed. Many conductors' rooms are equipped with racking for the storage of the conductors' ticket-boxes and equipment, which vary considerably in size and shape, according to the requirements of different operating companies; in some cases, where the station is a terminal, these rooms may also act as rest rooms.

Locker rooms providing accommodation for all personnel using the station are essential; in many cases the personnel changes in or out of uniform on starting or leaving duty and adequate space for changing may be required in, or additional to, a locker room. Full-length lockers to hold an overcoat are desirable, together with some drying facilities, although with the modern closed types of buses drivers and conductors no longer get excessively wet. Details of planning locker rooms are given under " Office Buildings " and " Factory Buildings."

Canteens must be designed to give quick service, as the breaks for meals may be of short duration for drivers and conductors and other outside staff. Except where there is a large office or repair staff, additional to drivers and conductors, the canteen need not be large owing to the users' times for refreshment being often short or spread out over fairly long periods.

### Staff Bicycles

As operating personnel often arrives at and leaves the station before and after normal bus and train services, the use of cycles and motor cycles is common and it is of great importance that proper storage, preferably under cover, be arranged in positions to which only the staff have access. Details of planning for cycle and motor cycle storage are given in the sections on " Schools " and " Factory Buildings."

### Parking of Buses

Temporary parking of vehicles is often needed, and if garages are not planned in connection with or as part of the bus station some parking facilities are essential in the station itself. These may be under cover, but as vehicles are only likely to stand for relatively short periods open-air parking may be quite adequate.

It should be designed so that any vehicle may be moved without disturbing others; it is important that the parking does not in any way impede the free movement of vehicles into and out of bus stances. Reference to Figs. 2–9 will show the data required to plan suitable parking of this kind.

### Fuel- and Water-filling

Vehicles are usually operated for 12 hours or more per day and may, therefore, be dependent on replenishments of petrol or fuel oil and water several times during a working-day. These supplies, for all but long-distance vehicles, are usually provided at garages or terminal points; public-service vehicles must not be filled with petrol while carrying passengers. It is also undesirable to have vehicles filled within station buildings or near passenger platforms. The storage of petrol is controlled by the Petroleum Act, 1928, and Petroleum Spirit Regulations 952/29, which require storage places to be licensed. Storage tanks are better placed outside buildings and cut off from buildings by fire-resisting construction, or placed underground; they must be at least 20ft. from public highways. Filling sometimes takes place in an open (often roofed) space in front of or behind the garage, or in some space adjoining a station in a position to which the public does not normally have access. More often filling occurs just as the vehicle enters or leaves the garage building. The storage tank may be at a distance from the delivery pumps, which are generally electrically operated. (*See also* Fig. 14.)

### Garages and Maintenance Buildings

Buildings are needed for vehicles when not in use and for cleaning and other daily services. This work is distinct from major repairs and overhauls, for which more fully-equipped and centralized workshops may also be needed; these may be associated with, or be part of, a garage. Garages

and repair shops are usually separate from bus stations; the latter are normally planned on relatively extensive urban sites, whereas garages and, particularly, repair shops, also needing considerable site areas, may, with advantage, be planned on less central, and therefore less costly, sites.

There has been some garaging in the open air, but in exposed districts and in winter this is undesirable as vehicles need to be kept warm. However, if the parts of the garage used for cleaning and particularly servicing are enclosed and heated, the parking portions may, in some areas, be unheated. Some open parking, as for instance in a forecourt to a garage, is advantageous for relatively short parking-periods and provides a parking-space, at rush periods, for buses waiting to be cleaned or serviced.

The essential planning-requirement for garages is a large floor area with the minimum of supports to cause obstruction. The area should be based on an allowance of 300sq. ft. per vehicle, although with the increasing legal overall sizes space allowances can well be increased to 325sq. ft. for each vehicle. A clear height of at least 16ft. below trusses or tie bars is essential and preferably rather more. Good daylight from roof lights is also essential, together with carefully arranged artificial lighting, as much cleaning and servicing is carried out at night.

With normal circulation, vehicles enter the garage and are refuelled near the doors, while the cleaners clear the rubbish: they then pass through a washing-area and after being cleaned externally move to a space where they are polished and vacuum-cleaned internally; after cleaning they pass on to the inspection pits for inspection and repairs. Adjoining the inspection pits should be stores for spare parts, tyres, etc. It should be remembered that a large amount of rubbish is accumulated from vehicle cleaning and arrangements must be made to collect suitable paper for salvage and for the incineration of useless rubbish. (*See* Fig. 14.)

The floor of the washing-area must be laid to falls with a central sump. Various systems for washing are in use, but all involve large quantities of water delivered at high pressure.

### Inspection Pits

These should be the full length of vehicles; proper piped services for oil guns, etc., should be taken to each bay and the floors should be laid to falls and drained into gullies. The pits are sometimes covered with removable boards or sectional metal covers. The essential details are shown on Fig. 15.

### Central Workshops

Central repair- and workshops are typical industrial buildings and as such are outside the range of the present articles. It is sufficient to say that they require large clear spaces for vehicles under repair, adjoining which should be planned benching and spare stores. A machine shop is also usually needed; it should be separate from the vehicle stands and assembly benches. Provision will usually be needed for lifting engines out of vehicles; this may be achieved by an overhead travelling crane or by power-driven mobile cranes. Some garages provide for the lifting of bodies from chassis and conveying them to a separate body-shop with woodworking and spray-paint shops adjoining. Woodworking should be separated to avoid the dust causing troubles in other work. Spray-painting is sometimes carried out in the main shop; but it should be done in properly planned, artificially ventilated, and totally enclosed units. Inspection pits are needed, similar to those described above.

Main stores should be planned centrally in relation to all departments which may need access to them. Stores have heavy deliveries, and close proximity to a good roadway and possibly to a rail-siding are site assets.

A first-aid room, canteen facilities and staff cloaks and lavatories are essential.

### Bus Stopping-places

Stopping-places to pick up and set down passengers, other than at bus stations, fall into the following classes:

(a) Terminal and interchange stops for local and country services.
(b) Urban street stops.
(c) Rural road stops.

At all these stops space must be available for varying numbers of passengers; this may or may not necessitate arrangements for queueing. All stopping-places should be clearly marked so that they may be seen both by pedestrians and bus passengers for a considerable distance. If possible, stops should be arranged so that a driver can see them at least 100yds. ahead, and twice this distance would be advantageous. It is desirable at many stops to display timetables. In exposed and wet districts main stopping-places should provide covered and if necessary enclosed waiting-places.

### Terminal Stops

It is essential that these be planned to provide sufficient space for the vehicles to turn without reversing. If they are used by many vehicles there should be special sanitary facilities for drivers and conductors; it may be that many terminal stopping-places are associated with public houses for the reason that special accommodation is frequently omitted. A covered waiting-shelter for passengers and staff, together or separated, is almost a necessity for a terminal stopping-place unassociated with a bus station.

### Urban Street Stops

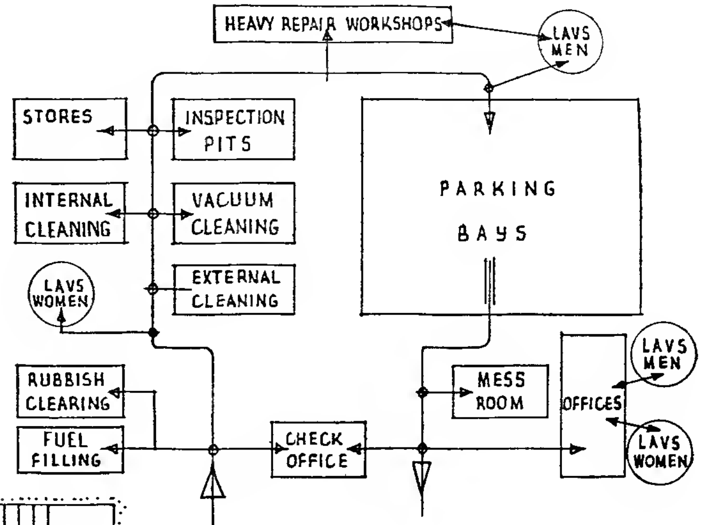
In busy streets and on roads carrying heavy traffic-loads buses should not stop in the traffic stream and thus delay or slow down the traffic; consequently the placing of stopping-bays is desirable. The set-back in the footway or the increased road width should be not less than 9ft. and probably 10ft. The lengths are dependent on the number of vehicles expected to be at a stop at one time, allowing 50ft. run per vehicle to provide for pulling in and out without waiting for other vehicles to move. These set-back stops should not be too near to cross-roads or to traffic lights. (*See* Fig. 16B.)

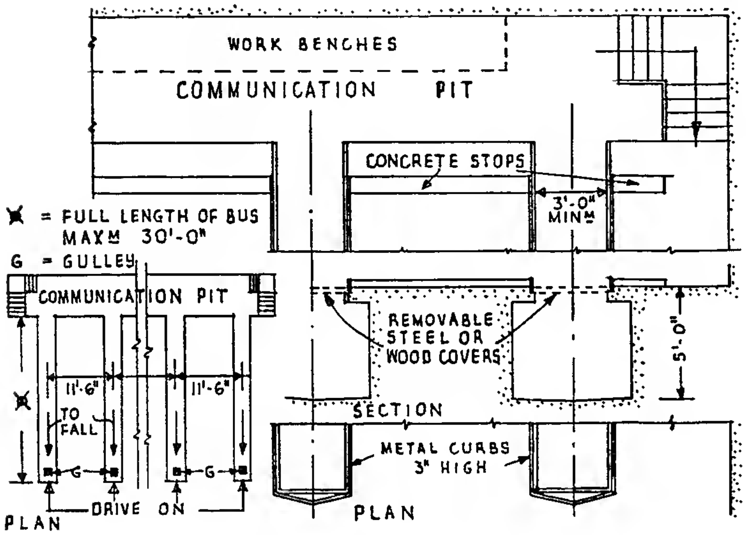
When set-back stops of this type are used and queueing, especially in covered spaces, may take place, the width of the footway needs to be such that there is at least 8ft. of free space between the queue and any adjoining building or fence.

### Rural Stops

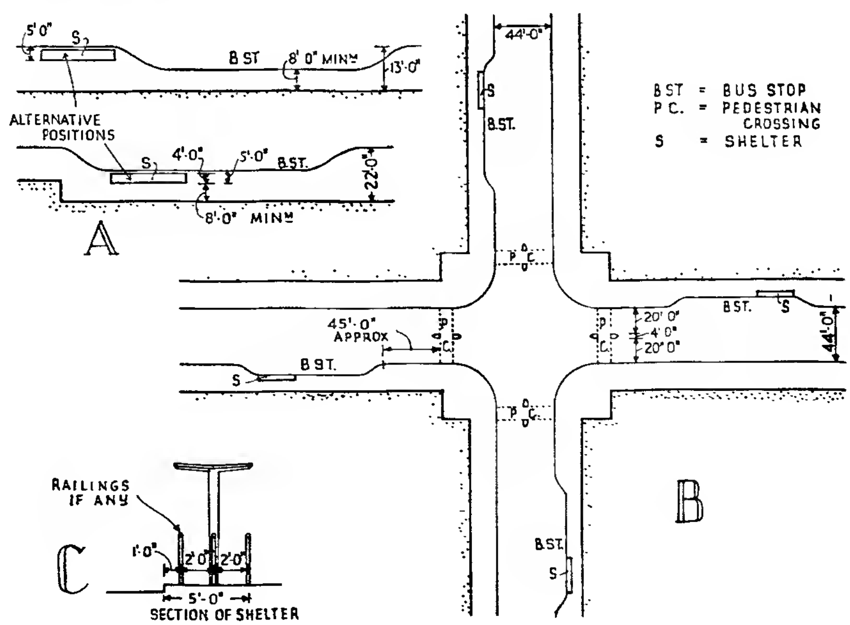
No special provisions are usually made for intermediate stops in rural areas, other than the installation of stopping-place signs. In those districts, however, where services are infrequent it is sometimes desirable to provide small shelters in which passengers may await the buses. They may be open on one side, or partially closed, and can well be combined with telephone boxes; timetables and a notice board are almost essentials for this type of stop. (*See* Fig. 16A.)

Fig. 14 General analysis for maintenance garages




Left: Fig. 15 Inspection pits



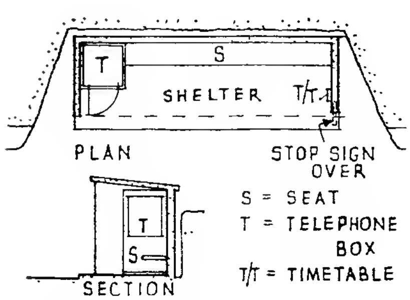




Fig. 16A Rural bus shelter

Fig. 16B Urban bus stops

### Express Services

Long-distance express services do not normally pick up casual passengers and all journeys are pre-booked. There are usually regular stopping-places in all towns and villages through which the services pass; these may be merely a pull-up in a street or a call at a bus station. These services, however, have to make regular stops for the comfort and refreshment of passengers and crews and for refuelling, etc. It is obviously preferable that such stops should be at bus stations which can provide proper meals or light refreshments and adequate sanitary facilities. On some routes these stops are made at way-side cafés, in market places, at urban or rural inns or similar establishments. All services would be greatly improved if stopping-places could in all cases be properly planned units. The restaurant portion of the buildings described in "Camps for Motorists" is one type of suitable unit. On many routes, however, the demand for these facilities might be inadequate unless other passing traffic, such as private motorists, were also catered for. On very long-distance services overnight stops may be needed and special simple hotel accommodation might be planned, giving also stopping-place facilities for day-time traffic, on the general lines of "Camps for Motorists."

### The Taxi-cab

This public-service vehicle is unlike the motor bus or motor coach in that it does not adhere to regular routes and timetables and consequently is, in most respects, similar to a private motor car in its movements.

Taxis are, in many areas, vehicles constructed to a special design carrying five passengers inside with facilities for a quantity of luggage. They have to be able to be handled and particularly turned, in very small spaces. The turning-circle in many areas, of which London is the most important, is limited to a maximum of 25ft.

Provision has to be made in streets and elsewhere for standing-places or taxi-ranks; often of necessity these ranks have to be in or very near the busiest and most congested parts of towns and, in consequence, must be sited or planned with considerable care.

Taxi-ranks may be arranged by parking-places in a single row at the side or in the centre of a street or in a double row in the centre of a street. The usual method is to provide space for a single row of taxis in the centre of a road facing in one direction; this necessitates the vehicles crossing the traffic to reach either kerb to pick up passengers; this is particularly bad when passengers are at the pavements on the right-hand side of the stationary taxis. Fig. 17 illustrates two improved methods of planning taxi-ranks. Diagram A shows a system in which the standing vehicles do not obstruct the normal moving street traffic and Diagram B illustrates a scheme which, to a great extent, overcomes the disadvantage of a single line facing in one direction. If this scheme is used it is essential that the traffic-way be 47ft. wide for one rank and 54ft. wide for double ranks in order to allow 25-ft. turning-circles and two lanes of traffic in each direction. The dimensions would have to be increased in areas where turning-circles are not limited and are similar to private motor cars, in order to avoid holding up traffic while a vehicle reverses.

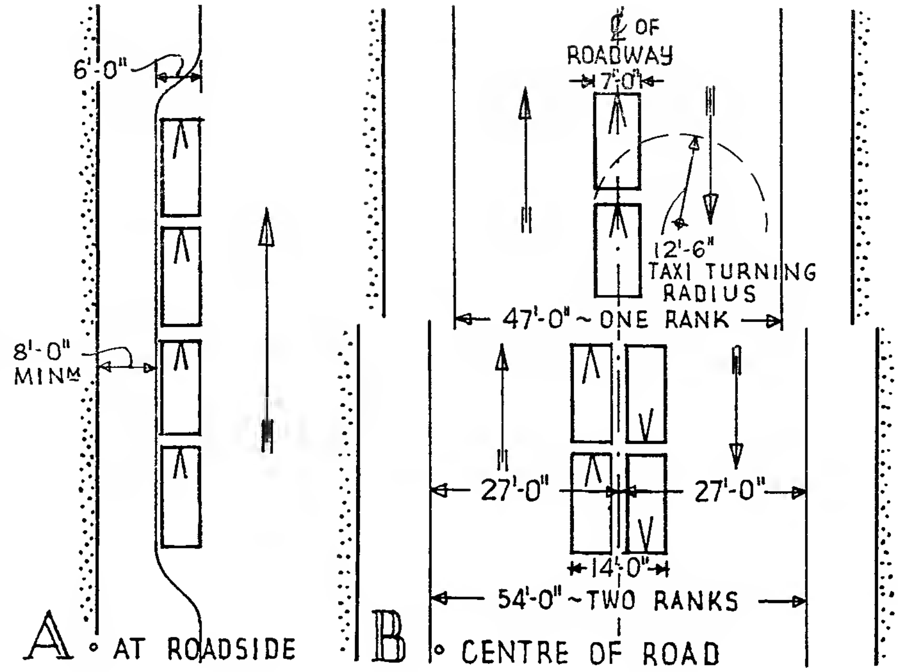



Fig. 17 Parking of taxis

Taxi-ranks are generally needed in association with railway and bus stations and in these cases facilities have to be provided for taxis to set down, to pick up and to wait. To set down and pick up at the same point is usually necessary, except at important and very busy stations, especially termini, where separate arrival and departure roads are advantageous and often found. Parking is needed only in association with the picking-up of passengers; it is usually provided, in common with private cars, in the station yard.

Facilities for a telephone are desirable at all taxi-ranks so that they may be called to an address without being fetched. This requirement is usually met by installing a telephone in a weather-proof box attached to the most convenient lamp-post or traffic sign in the vicinity of the head of the rank or, if a cabman's shelter is associated with the rank, it may be housed in a wall of the shelter.

In many larger towns where the houses and garages of the taxi drivers are likely to be far from the busy ranks, street shelters, at which facilities for meals are available, are provided; such shelters need very special planning consideration to avoid obstruction of normal traffic. They should *not* be in main streets or occupy footway space, but rather should be planned to occupy back-land or be recessed into general frontages. The vehicles belonging to drivers using the shelters for rest and refreshment should not be parked in streets, unless on a regular and properly sited rank; another argument for locating taxi-cab shelters away from streets is in order to ease urban traffic conditions.

### The Open Garage

In cities and towns land values prohibit separate lock-up garages nor, in many instances, are they particularly necessary. Open garages provide large undivided floor spaces on one or more floor levels where cars are arranged in rows. As the majority of car users often come and go in rush periods of short duration, easy access to and from car berths is essential, therefore planning has to be based on single rows of cars placed on either side of driving aisles; these aisles must be of such widths as to allow for driving a car in and out of a berth between two other vehicles without risk of damage. The berths are usually based on a width of 8ft. and a depth of 16ft., which is sufficient for all but exceptionally long cars which may be placed together either in a special part or a special floor of the garage. The width of berth is arrived at by taking the width of a car as 6ft. and allowing 1ft. for manoeuvring and opening of doors, etc. The best method of parking cars is to have the bonnets towards the driving aisle.

The width of the aisles should be at least 20ft. although there are examples where only 18ft. width has been allowed.

Fig. 18 shows typical spacing of car berths based on these dimensions together with widths of buildings necessary to accommodate various numbers of rows. Cars should not be placed in double rows with access on one side only as the time required to move cars from the front row for the removal of a vehicle at the back is too great and confusion is created.

In cases of extreme necessity, however, double-row parking has been adopted, and considerable saving of space has been effected in this way, as in this case one aisle serves four rows of cars.

Any columns required to support superimposed floors or roofs should be placed at least 3ft. within the 16ft. allowed for the length of the cars to permit easier turning; thus the normal column spacing is about 25ft. (or more) from centre to centre.

The space between columns should be either 16ft., 24ft., or 32ft. which accommodates two, three or four cars respectively. Any spacing between these dimensions is obviously uneconomical.

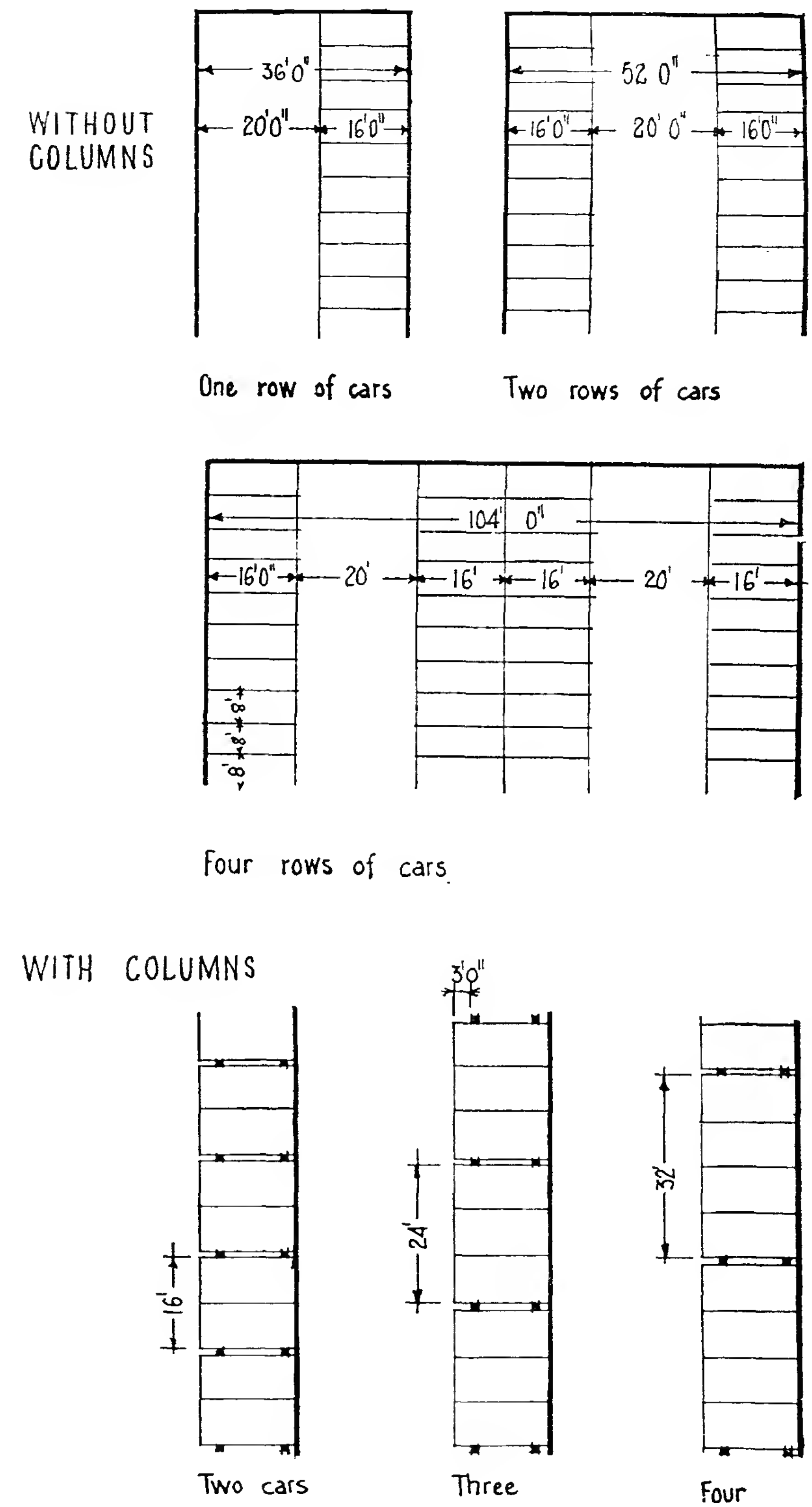



Fig. 18 Open garages. Note that the widths of parking spaces desirable is 8ft. 0in.: the minimum dimension is 7ft. 0in.

# *Garages and Parking Spaces*

## PUBLIC GARAGES

### Multi-floor Garages

Where several floors are to be used, methods of rapid inter-floor communication have to be considered; firstly, by means of ramps or sloping ways, and secondly, by use of lifts; the former, although requiring more actual floor space per car stored, has generally been found to work more satisfactorily in practice owing to the time and trouble saved in getting each vehicle in or out of its berth, especially in rush hours. Ramps are cheaper than lifts in first cost and require very little maintenance, both of which are highly important factors; the ramp system involves no cost in moving vehicles, as they pass from floor to floor under their own power.

A number of schemes has been put forward, and some have been built for automatic mechanical handling of cars in " auto-silos " and the like. Most projects rely on centralized push-button or even electronic controls and result in the planning of highly specialized buildings individually fitted to accommodate the system adopted. No single type seems yet to be generally approved by use or economy of operation and therefore the planning of such buildings is not yet reducible to exposition in these notes.

### Floor Loading

The floor construction should be based on allowances of 80lb./sq. ft. for vehicles not exceeding 2 tons gross weight and 150lb./sq. ft. for vehicles not exceeding 4 tons gross weight.

### Ramps

The slope of ramps may be as steep as 1 in 5 but they are generally 1 in 7 (or 15 per cent), which requires an approximate length of 70ft. to rise 10ft. 6in. from floor to floor. Turns on the ramps should be slightly banked and the whole surface treated to give a good hold for tyres. The floor heights of garages should give 8ft. 6in. in the clear between beam casings and the floor level.

Ramps for smaller buildings may be as narrow as 8ft. 6in., but they are better if 10ft. is allowed and if vehicles have to pass one another in opposite directions a width of 20ft. should be considered to be the minimum; also if one wide ramp is to be used for traffic travelling in opposite directions, up and down ways should certainly be separated by a kerb, or, more thoroughly, by a railing, although such precautions are frequently not taken. If but one narrow ramp is to be used for up and down traffic some system of signalling should be provided, to avoid cars meeting between floors. The radius of outside kerbs on all curved ramps should be not less than 20ft., based on the turning circle of the average-size cars, but it is better to allow a radius of 25ft., to avoid risk of damage to wings. Fig. 19 A, B and C shows three different methods of arranging double-track ramps in buildings; the hatched areas represent the space available for car berths, and it should be noted that certain of these spaces are not readily accessible, as that in the top left-hand corner of Fig. 19 A. Type A is the simplest, where each floor is level across the building; the ramp may easily be turned (at the lower end in the diagram) for continuation from floor to floor. Type B is somewhat more complicated, but has only one long ramp serving all floors at various points in its length as shown on the section. Type C is a continuous concentric curved ramp; the corners as shown are difficult to utilize, as are also the spaces enclosed by and around the ramps. This system is frequently used for long sites, the ramps sometimes being placed near the entrance or at the extreme ends. The central spaces within the ramps in Type C are seldom useful for storing cars owing to the difficulty of access, but they are, however, useful for motor cycles and sidecar combinations. One fault of Type B is the necessity, on leaving or entering a floor, of crossing the main traffic lines on the ramp.

Type D has a single ramp used for traffic in both directions, and is only suitable for garages where the possible number of car berths is not greater than approximately 300, otherwise congestion is likely to result. This type is not very satisfactory except on small sites where space does not permit double ramps, and even in such circumstances a considerable amount of floor space is wasted, as may be seen from the figure and the alternative use of lifts may be justifiable on central urban sites.

Diagram E illustrates a double-spiral type of ramp on which traffic cannot meet; this type is satisfactory in space economy and ease in controlling the traffic. This ramp is designed on the principle of a double-thread screw, up-traffic driving on one thread and down-traffic on the other, both ramps using the same space as is needed for a single ramp of the same diameter.

Type F is divided vertically into two blocks, one block of floors being set half a ceiling-height higher than the other; the floors are connected by short ramps. This system is very efficient, as regards proportion of floor space available for car storage to total floor area, and as regards handling of traffic; this applies more especially when the ramps are doubled and separate tracks provided for traffic in each direction as in Fig. 19 G. One half of the ground floor or basement will have a greater height, as shown on the right-hand side of Diagram F; this additional height is useful for showrooms, parking of commercial vehicles, or for a pressure-greasing department where hydraulic car-lifts are used. One disadvantage of the staggered-floor type of building is its uselessness for other purposes should the building not be further required as a garage at some future time, whereas in other types the ramps may be removed and replaced with normal floors comparatively easily.

A further development of the ramp is the " warped " floor type of garage as illustrated in Fig. 19 H. In this example the floors are laid throughout the building at a pitch similar to the ramped approaches which they adjoin. There are many factors favouring this system; at the same time there are three disadvantages, namely: in the first place, long sites which are not too wide for more than four berths and two aisles are needed to give sufficiently small gradients; secondly, cars are parked on a sloping surface (although it is very slight—only similar, in fact, to the curve of a normal road surface from crown to gutter), and cars stand across the slope; and thirdly, the building cannot be converted for other purposes. The benefits of the " warped " system are the low gradients utilized, good visibility for drivers and the parking areas are each easily accessible, though the largest possible areas be utilized and easy turning-radii planned. Construction costs are lower in this system than with ordinary ramps, due to the constant pitch of the floor without sharp banked curves, and consequently it is little more expensive than level floors in normal buildings. The authors have not seen or heard of

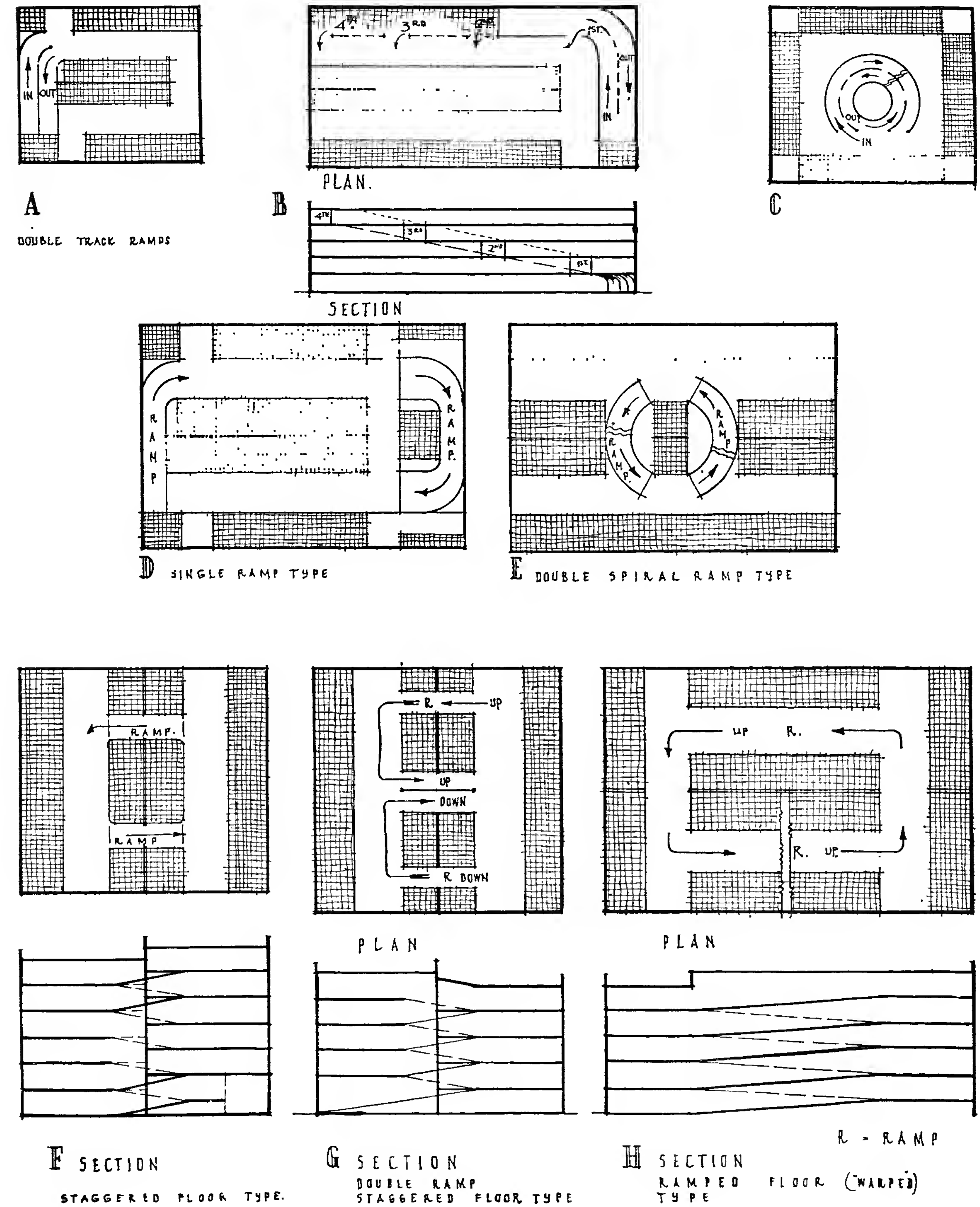

IN
OUT
A
DOUBLE TRACK RAMPS
4TH
3RD
2ND
1ST
OUT
IN
PLAN.
B
SECTION
OUT
IN
C
RAMP
RAMP
D SINGLE RAMP TYPE
RAMP
RAMP
E DOUBLE SPIRAL RAMP TYPE
RAMP
RAMP
R
UP
UP
DOWN
R DOWN
UP
R.
R.
UP
PLAN
PLAN
F SECTION
STAGGERED FLOOR TYPE.
G SECTION
DOUBLE RAMP
STAGGERED FLOOR TYPE
H SECTION
RAMPED FLOOR ("WARPED")
TYPE
R - RAMP

Fig. 19 Ramps

an example of this type in Great Britain, but several examples have been erected in America and Canada which have proved to be very satisfactory. The upkeep cost is negligible.

None of the systems can be claimed as pre-eminent, as site conditions (more especially size and shape) influence the selection of the method of inter-floor travel more than all other factors governing the plan.

### Lifts

Many multi-floor garages are served by lifts in preference to ramps, probably owing to the fact that lifts waste less floor area than do any of the ramp systems and consequently more cars can be stored to any given site area. Lifts are particularly useful for high buildings and for buildings on small sites. There are also examples in which lifts are used to serve the upper floors only while ramps are installed for the service of the two or three lower floors where cars are parked for short periods and therefore must be handled more rapidly. Lifts for private cars are usually about 10ft. wide and 20ft. long, as shown in Fig. 20 A. Sometimes the width is reduced to about 8ft. only and the length to 18ft., but the larger sizes are to be preferred. A lift 20ft. by 10ft. requires a well-hole about 21ft. 6in. by 11ft. 6in.; when several lifts are installed in a battery, less space per lift is needed. Lifts of such dimensions, having overhead machinery, require a height of 16ft. to 18ft. above the highest floor level to accommodate the machinery, gearing, cage, etc., and about 4ft. below the lowest. Lifts are sometimes run in open wells surrounded by wire enclosures only, but in larger buildings a fire-resisting enclosure is desirable, together with automatic fire-resisting cut-off doors or shutters at each floor level so as to avoid the risk of fire spreading from one floor to another.

The number of lifts required for a garage building presents a difficult problem. Two should be considered as essential to permit dealing with rush periods, and also to guard against a possible breakdown. Generally, it should be assumed that two lifts will handle up to 250 cars. Lifts are usually run at speeds of about 50ft. per minute; high speeds facilitate rapid handling of vehicles, and they should be designed to carry at least 30 cars in one direction per hour to the highest floor level. Sometimes lifts are designed to carry two vehicles side by side, but it is doubtful if this is, in fact, a real advantage over two separate lifts, except in initial cost and possibly in running costs; the benefits may be offset by delay in handling vehicles.

### Turntables

Turntables are often needed in garages where lifts are installed in order to move cars into lifts which may not be placed directly in the line of approach. These turntables should be at least 16ft. overall or better slightly more, although they can be made just sufficiently large to carry the maximum wheelbase of any car (namely, 12ft. 6in.), but it is wiser to have them as long or longer than the overall length of the cars, thus avoiding the possibility of damage to other vehicles or persons standing too near the moving floor. Turntables should move easily and quickly; they are usually installed without mechanical means of movement, but occasionally to increase speed of movement, the turning is done by electrical power. Turntables for commercial vehicles need not be greater than 22ft. 6in. in diameter and are often mechanically propelled. If there are definite and usual movements from one point to another which are at all regular, it is convenient to have stops to save time in adjusting the amount of turns.

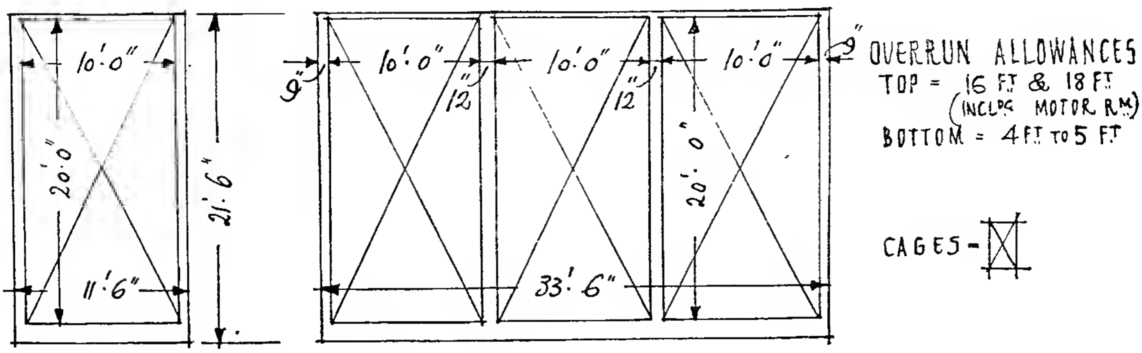
The placing of lifts and turntables is entirely dependent on the size and shape of the site and economic berth placing. Generally, lifts are placed as far as possible from the entrances in order to have the maximum space for movement of cars before reaching the lift. There are, however, several examples where the lifts are placed at the entrance so that vehicles on arrival drive directly into the lift. It should be borne in mind that lifts are fairly costly to install and need power and labour for their operation, as opposed to ramps on which cars are propelled by their own power.

Fig. 20 C illustrates an arrangement of turntables to serve lifts which have had to be placed at right-angles to the main approach to the garage.

As regards upper floors, turntables may not be necessary, as the time taken to manoeuvre a car into its berth, once it is out of the lift, is not so important, since each floor only handles a proportion of the total traffic, according to the number of floors in use; however, it may be wise in order to speed up handling on the upper floors, to make each lift primarily serve certain floors and to arrange the turntables on each of these in front of the particular lift assigned to the floor. The lifts, as shown, may be made to give access to floor areas placed both in front and behind the lifts, which means the placing of the lift somewhere towards the centre of the building. In such an example as this it would probably be wise to install fire-resisting doors or shutters at both ends of the lifts to overcome any risk of fire spreading by way of the lift shaft from one floor to another.

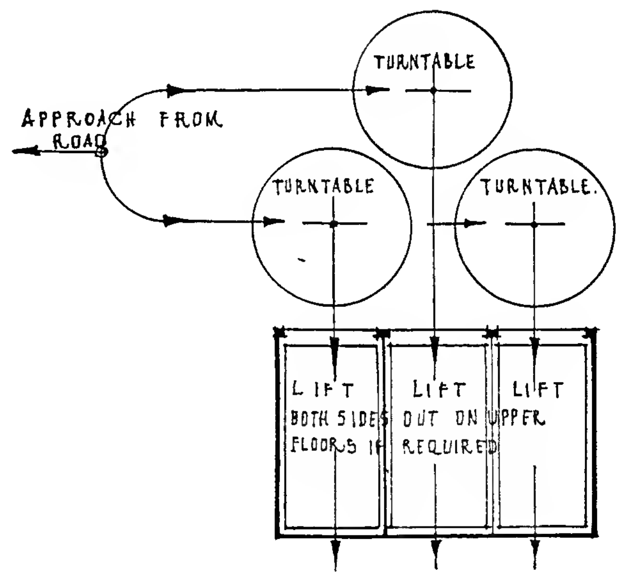
For convenience and rapidity of handling, lifts are frequently installed with turntables fitted inside the cages and two or more entrance and exit gates, so that when the lift reaches any particular floor level the vehicle in it may be turned so as to be driven to whichever part of the floor it is to stand on without circulating round the floor or having to reverse.

Fig. 20 shows two garaging systems based on combinations of lifts and turntables, the latter taking the form of a rotating part of the floor. Diagram D has two lifts placed centrally on a square or circular site and on each level a portion of the floor, wide enough to receive any size car (16ft.), is made to rotate, so that cars are delivered from the lifts on to this band, and while the lifts are dealing with other cars, the floor is turned until the car stands in front of a vacant berth, into which it is driven or pushed; when all the berths are full the rotating floor may then be loaded, leaving one vacant place to carry the first car wishing to leave. The system is probably difficult as regards construction and mechanism; in addition, approximately square or circular sites are needed, and there is waste space on each floor which cannot be used for parking. Diagram E illustrates a similar system adopted for use with a rectangular site of about two squares in area; in this example two lifts, each delivering in two directions, are placed centrally with a rotating floor area on each side, on which vehicles are moved as in example D. In example E the central areas within the rotating floors may also be used for parking. It is desirable in both types to install two lifts, to avoid slowness of service and congestion and

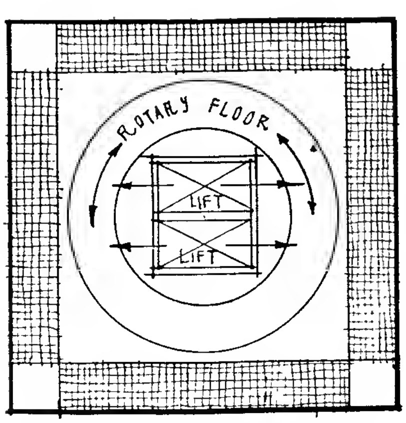


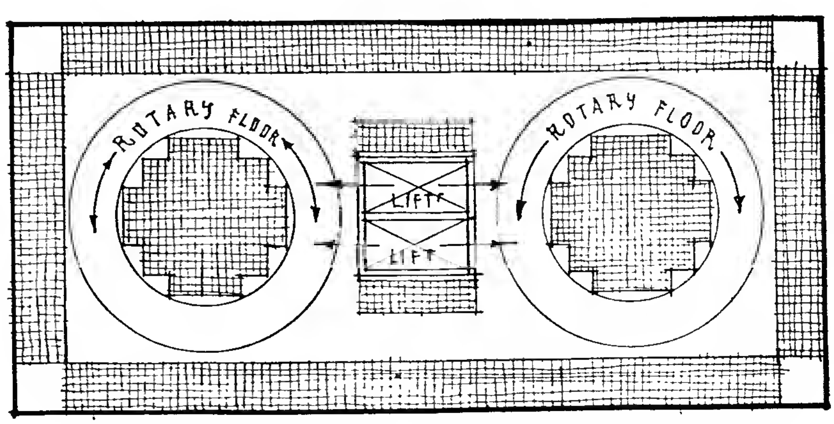

A. SINGLE LIFT. B. BATTERY OF 3 LIFTS

CAR LIFT DATA




C LIFTS & TURNTABLES




D SINGLE UNIT E DOUBLE UNITS

TYPICAL ROTARY FLOOR PLANS

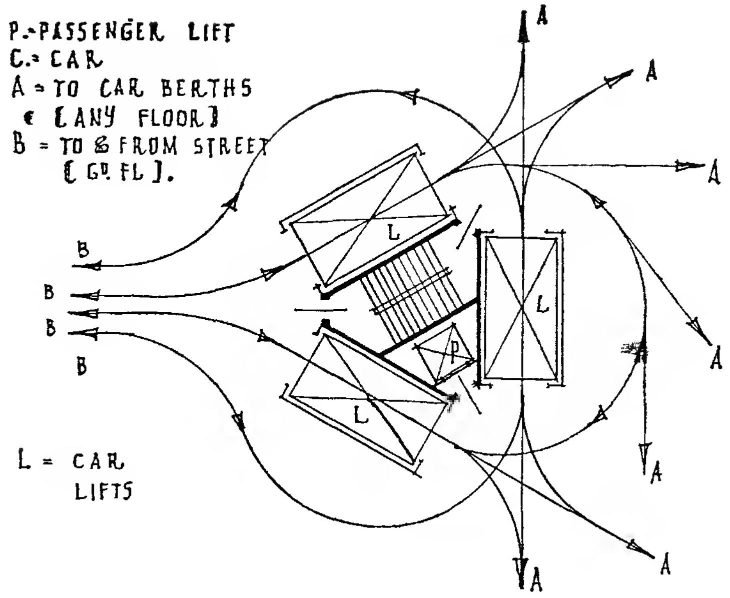
Fig. 20 Lifts and turntables

to guard against breakdowns. The rotating floors, owing to the possible total weight of cars which may be on them at any time, should be made of steel plates and should be mechanically operated. The blank spaces at the corners on the diagrams are useful for staircases, passenger lifts, lavatories, etc.

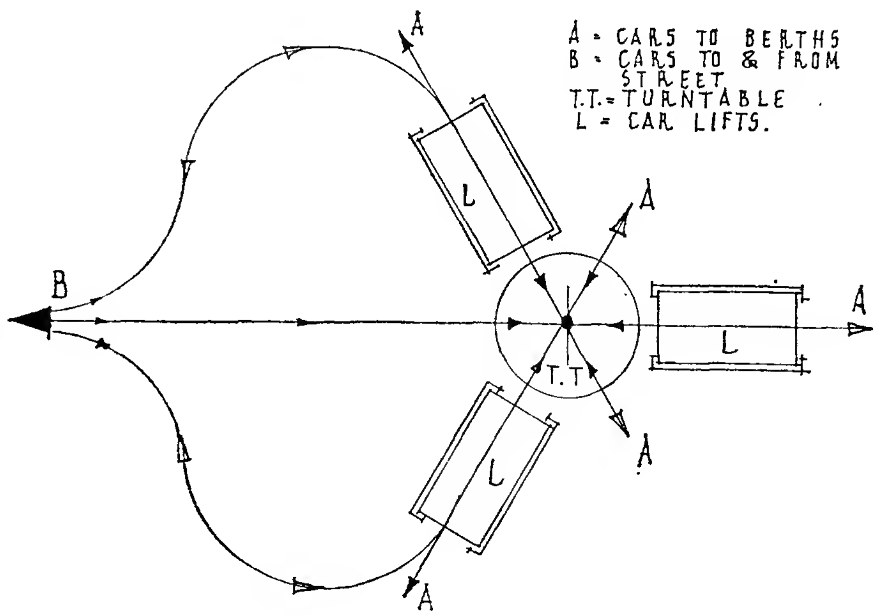
**Lifts and Turntables**

There have been several American schemes of car parking, based on the idea of platforms which are attached to continuous hoists. The cars are run on to a platform, which rises until the one side is fully loaded, after which the machine continues and the platform crosses over the top and commences to descend on the other side. To remove any vehicle the whole is revolved until the platform required is at the ground level. This system seems expensive to install and maintain, and has only a small storage capacity, but it only requires a ground area of about 22ft. square. Several methods of inter-floor travel by means of lifts have been suggested where cars are placed on turntable trucks or traversers, either on entering or leaving the lifts, the truck then being moved along a track from the lift and turned so that the vehicle faces the berth allotted to it. These systems seem to call for too much handling of cars and consequent loss of time, compared with ordinary lifts or ramps on which the car uses its own power for manoeuvring into berths; in aisles required for turntable tracks no saving is achieved over the width of aisles required for normal parking. The tracks, however, require greater floor thickness, as they have to be sunk so that the top of the track is at floor level.

Fig. 21 A suggests a system of ordinary lifts for a large garage building placed in such a manner that turntables are unnecessary. The approach or driveway from the lifts is easily negotiated within the "lock" of a car moving under its own power; the loss of space is in reality little more than that of a ramp system, while ease and speed of movement of vehicles are considerably greater than with an ordinary square battery of three lifts. The central space may be used for a staircase or passenger lift for use of car owners, chauffeurs and garage staff, or, if required, for an open well for fire-escape purposes. The lifts arranged in this manner require rather more enclosing brickwork than for a bank




A TRIPLE LIFT SYSTEM




B TRIPLE LIFT SYSTEM WITH TURNTABLE

Fig. 21 Triple lift systems with and without turntables

of three lifts. Fig. B suggests a scheme for use where the lower floor space is used for showroom requirements. One turntable serves the three lifts from the main entrance, after which the cars move under their own power.

### Roofs

The roof of a multi-storey garage may be used for open-air parking at lower charges than are made for the covered areas. Access is obtained by continuing ramps or lifts, but precautions have to be taken to prevent rain running down ramps to lower floors, or down lift-wells. Ramps should be roofed over and enclosed on the outer side right up to the end to protect the floors below. High parapet walls are desirable, and in some instances might need to be as much as 8ft. high as a fire protection for adjoining property. The layout of parking spaces or berths on roofs would be similar to that on lower floors.

### Regulations for Large Garages

Public authorities and insurance companies insist on stringent regulations regarding construction and use of multi-floored garages. These regulations are definitely laid down in only a few instances, but under approval powers various conditions have come to be generally recognized. Special consideration has to be given to means of escape from upper floors and usually two staircases are needed, enclosed in fire-resisting materials and giving access to the open air; also it is required that the approach to the staircases on each floor should be through an open-air cut-off. When buildings are of more than one or two storeys it is desirable that each floor should be cut off from the others by means of automatic fire-resisting shutters or doors.

In some districts openings are not permitted connecting the ground floor and basement except through the open air, and when basements, in buildings over 250,000cu. ft. in content, are used for car parking, it is necessary to provide windows extending from floor to ceiling for 30 per cent of the perimeter of the floors, and, where street frontages are not available, made to open on to areas called " blast ducts."

Battery, machine and oil store rooms have to be cut off from the remainder of the building by fire-resisting partitions, and have to be approached through the open air. Offices, chauffeurs' rooms, etc., must be partitioned off from parking areas by means of fire-resisting partitions and doors.

Petrol tanks of vehicles must not be filled within the building, or nearer than 20ft. to the back edge of a public footway.

Special precautions are essential when planning garages in basements or sub-basements, and reference should be made to the Home Office Circular No. 118/1951 in connection with the Petroleum (Consolidation) Act, 1928, as this draws attention to the desirability of following the recommendations of the B.R.S. Report on precautions against fire and explosion in underground car parks (H.M.S.O., 1950).

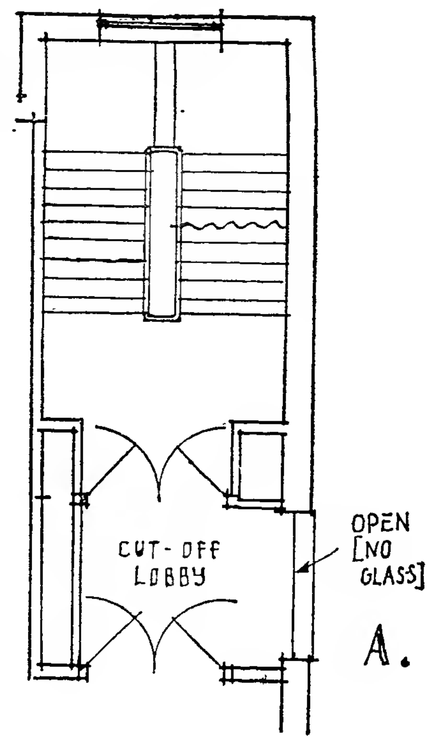
Natural cross-ventilation is needed in basements to provide at least two-and-a-half air-changes per hour, which has to be supplemented to provide six changes per hour by mechanical means. No repair shops having power-machines are permitted in these basement garages. Electrical equipment has to be of flame-proof types to B.S. 229. Sprinklers, drenchers and normal fire equipment are essential. Petrol-filling or storage is not permitted in basements.

### Staircases

All staircases should be enclosed and cut off at each floor level with fire-resisting doors, but in addition, the escape stairs should have the safeguards already suggested. The staircases may be required to be ventilated from the open air by the omission of the glass to the openings, which should be of large area with simple fire-resisting self-closing doors at the landings, but in some instances a similar arrangement, as shown in Fig. 22, Diagram B, is adopted with the addition of an automatic fire shutter controlled in conjunction with the sprinkler system. In many buildings a scheme as shown in Diagram A is used; this arrangement consists of a lobby, formed by two fire-resisting doors, which is ventilated to the outside air, thus forming a complete cut-off between floor area and escape staircase serving other floors of the building.

### Passenger Lifts

In addition to any lifts installed for moving vehicles from floor to floor, passenger lifts are desirable, and in the case of many-floored buildings are



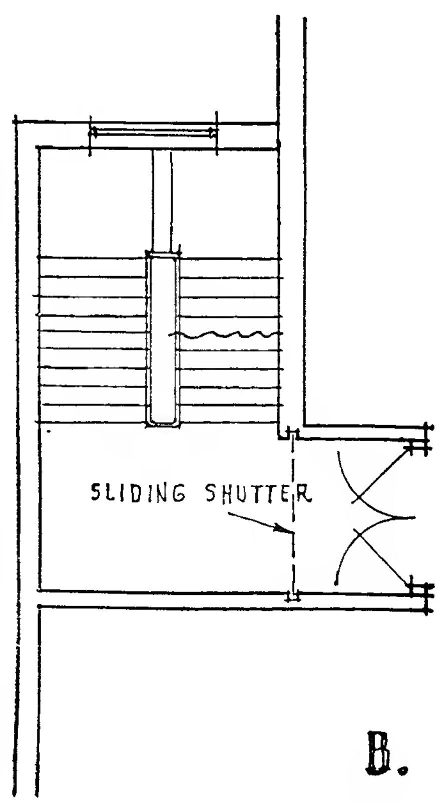




Fig. 22 Staircases

necessary to convey owners to the floors on which their cars are parked, or to convey garage drivers to the car berths in order to hasten delivery to owners waiting at the entrance to the garage. These lifts need not be of very large capacity but should be of fairly high speed. (*See* Part 1: Circulation.)

### Lighting

The various floors of a multi-story garage should have the maximum amount of daylight possible, having regard, however, to the provision of sufficient solid walling between each floor level to protect the floor above from direct action of flames in the event of fire.

Adequate lighting is necessary on ramps and, as this cannot always be provided by means of windows in daytime, well-spaced lamp fittings are essential and should be arranged to shine as little as possible into the eyes of drivers as they ascend or descend the ramp. This point requires special consideration if traffic in both directions uses the same ramp.

Artificial lighting of the ordinary floors should be by means of fittings installed over driving aisles where most light is needed and, when placed in such positions, should give sufficient light for general purposes over the remainder of the floor area.

### Ventilation

Upper floors of garages are frequently not provided with artificial ventilation, but it is often necessary for floors below ground level or on any floors where natural through currents of air are difficult to arrange. It should be borne in mind that fumes in garages which have to be controlled by a ventilation system may be heavier than air and should, therefore, be extracted near floor level and, owing to the presence of carbon-monoxide, discharge should be made at roof level.

### Heating

A heating installation is essential in all multi-floored garage buildings, although temperature to be maintained need not be very high.

Any ramps exposed to the open air, i.e., to roofs or basements, should be protected against frost conditions by the installation of heating coils (electric or hot water) incorporated in the slabs or paving forming the ramps.

### Entrances

Some local authorities restrict the width of roadways crossing pavements to a maximum of 20ft., presumably to safeguard pedestrians; this width permits only two lines of traffic and if more traffic-ways are needed, an island separating each crossing should be introduced in order to divide the roadways into units of 20ft., or less.

The relation of entrances to surrounding streets is of the utmost importance. Junctions of streets are generally to be avoided, as traffic may be held up at the crossing and impede the garage entrances and exits; exits into busy streets are also apt to lead to road congestion.

It is advantageous to have approaches from two different streets to avoid congestion of traffic and temporary traffic blockages in either street. It is better to have garage approaches placed in streets which are not main traffic routes, although there is a loss of advertising value through the buildings not being easily visible to rapidly moving traffic on main roads.

The entrance and exit to the building itself should be under one control as, for example, on each side of a control office, thus reducing the labour required to look after vehicles entering and leaving the building, but in large schemes separate controls may be desirable. The entrance to the building should be set back on the site in such a manner as to provide a forecourt in which traffic may wait on arrival or on leaving, without disturbing road traffic or pedestrians; these forecourts are also used in most schemes for the service of petrol, oil, and other supplies. An entrance layout based on this forecourt principle would have a further important factor, which is the desirability of opening up approaches as much as possible, so that vehicles on the road or leaving the garage may be visible to one another for the longest possible time at the widest possible angle of sight. Direct access into the building from the road without a forecourt makes visibility poor for drivers leaving the garage and virtually necessitates a look-out man to control the exit.

An open entrance layout usually has good positions for control offices. A position may sometimes be chosen to control both entrance and exit to the building as well as the forecourt and any pumps that may be placed there. The control office should be approachable either from the forecourt or from inside the garage itself. This office should have telephone communication with all floors and departments of the garage.

Entrances and exits should not be placed in one-way streets unless there is a one-way street on each side of the building with traffic in different directions. Particularly clear direction signs should be installed for guidance of vehicles both entering and leaving the garage.

If space permits, the ground floor of the building should not be used for ordinary parking but should be given up to showrooms and offices, to car washing, battery service rooms, etc., with ample turning and circulation space for cars.

### Showrooms

Showrooms are generally placed on the ground floor of garage buildings so as to provide for show windows and other display space to the street; occasionally part of the first floor is also used. Showrooms are often divided by entrances and exits to the garage portion of the building, but, on the whole, it would seem better to avoid this division and group all show-space together. On the other hand, it may be argued that clients calling to collect cars from garage berths should be made to pass through the showrooms if possible and, in any case, it may be advantageous to place the public waiting-room for the garage adjoining the showrooms.

Showrooms should be separated from the garage either by a solid background or glazed screens, the former being more satisfactory from the point of view of designing the show-space as seen from the street. Special consideration should be given to the use of curved non-reflecting show windows; motor-cars are generally seen in the open air, and when seen through non-reflecting windows the illusion of open air is better suggested. Car access to show-space is generally from inside the building through the background or back-division screen, thus eliminating the necessity of making part of the street window to open; although the latter may be unavoidable on small sites, it is expensive on a large scale. Show windows for motor-cars should not, in general, be less than 20ft. in depth; in addition, thought should be

given to the provision of suitable display windows or cases for accessories.

Proper sales counters are needed for spare parts and accessories, and should incorporate display of the most attractive and saleable accessories and not merely be, as is often the case, a dirty, oily bench or rough counter. These sales counters are generally better placed on the ground-floor level with lift communication to store rooms, which may be placed either in the basement or at the top of the building.

### Lavatories

Lavatories are required for the use of male and female visitors, chauffeurs, garage and office staffs. Those for the use of visitors should be placed near the public waiting room, and those for the chauffeurs adjoining the chauffeurs' room. Accommodation for the garage staff should be grouped together in small buildings, preferably near the workshop or repair department, but in large garages provision is desirable on each floor to save loss of time. Office staff lavatories should be attached to the office. It is, of course, advantageous to plan lavatory accommodation in similar positions on each floor in order to group plumbing services together. Each lavatory should provide washbasins and W.C.s. Attached to visitors' lavatories, changing rooms and baths are occasionally installed, for use of out-of-town customers who wish to change into evening dress. The staff lavatories should also provide space for the installation of lockers for outdoor clothes, overalls, uniforms, etc.

### Waiting Rooms

A room should be provided where customers or friends may wait and it should be placed on the ground floor and near the entrance. It should have easy communication with the inquiry counter and be near the passenger lift to the upper floors. Some garages provide staffs for handling the cars from entry to exit, to avoid the necessity for the customer to waste time in the actual parking of the car on upper floors. Waiting rooms should be comfortably furnished and pleasantly decorated. In some instances a parcel room has been installed near the waiting room, to which shops may deliver parcels of goods ordered in the town for collection by the customers when leaving in their cars; this system often saves shopkeepers long delivery journeys and also encourages garage business, as customers are more likely to park cars instead of driving from shop to shop.

### Chauffeurs' Room

As chauffeurs may often have long waits, it is wise to provide a room for their use. The room may be placed on any floor, but should have telephones and loudspeaker communication to the inquiry bureau and should be placed near the passenger lift. A canteen and small service pantry is often provided to serve light meals to chauffeurs or this service may be shared with a staff canteen.

### Offices

Administrative offices, other than the control and pay offices at the entrances and exits, may be placed anywhere in the building, though preferably within easy access of the customers' inquiry office and sales counters. The office staff is generally small, even for a very large garage and therefore only about three or four rooms are usually needed; these generally consist of a manager's office, typists' room and a bookkeeper's room. Small offices for superintendents are usually needed on each floor in large buildings; these are often tucked away quite satisfactorily in any odd corner useless for car parking, but should be so placed as to have good visual control of the whole floor area.

### Store Rooms

Store rooms are required for spare parts, accessories, cleaning materials, etc., generally planned where communication can easily be provided by lifts to sales counters or to repair departments. Space usually does not permit stores on ground floors, therefore they are usually planned in basements or on top floors. The equipment of the rooms consists of suitably designed racks, bins and shelving, made of wood or metal, one or more work benches and a storekeeper's office.

### Battery Service

All garages require facilities for storage and recharging of electrical batteries, and in many areas the accommodation for this department has to be separated from the normal work of the garage by fire-resisting materials and in some cases has to be approached from the external air. The actual charging of batteries and the storage of recharged batteries, together with spares, are sometimes separated into two rooms connected by doors or, if on different floors, by small service lifts. The recharging room is best placed on the lowest floor of the building, so as to provide a solid base for motors when these are required. Care has to be taken to provide proper benches with lead or other acid-proof tops. The batteries are charged on benches or racks, usually placed against walls on which the leads from the motors or mains are fixed. Low racks are needed for the storage of acid and distilled water containers and further racks and bins for spare parts and new batteries.

### Services

Compressed air is required for the operation of many types of petrol and oil pumps, as well as for tyre service; for the latter purpose outlets should be provided in the entrance forecourt and also on each floor level. The motors and compressors for all purposes should be located together, preferably on the ground floor or in the basement and be in a separate room adjoining the garage, cut off by fire-resisting materials. The plant should be duplicated to obviate breakdown.

Water should be provided on each floor for filling radiators and it is also needed for car washing; the pressure for the latter purpose may need the provision of pumps or be dependent on the height of the storage tank above the car-washing department floor level; if sufficient pressure is available and it is permitted, connection may be made direct from the supply company's mains. Pumps, if required, should be placed in the basement, though portable machines with flexible connections to water points are now in use. A sprinkler system is installed in many garages; the water discharged by such a system has the advantage of smothering petrol fires by the elimination of the air necessary for combustion. Sprinkler outlets should be at ceiling level and each should cover not more than 100 superficial feet of floor area. Water supply for a sprinkler system may be taken directly from local supply mains or through high-level storage tanks, dependent on conditions of the supply and its pressure. In addition, fire-fighting apparatus especially suitable for dealing with petrol fires (sand buckets, foam sprays, etc.) should be distributed at frequent intervals throughout garage

buildings, particularly near petrol and oil storage and filling departments. Petrol and oil must not be fed into vehicles inside the garage building or on the various floors, but should be supplied from pumps installed at the entrances or exits of the building.

In some garages use is made of old oil from the car sumps as fuel for engines to make electrical power for the various local motors required in various parts of the garage, such as for water pumps and air compressors. The motor generators used for running on this waste oil are of diesel type, using the oil in its natural waste state after straining to remove any metal or other solid matter and dilution by about 50 per cent with new fuel oil. Ordinarily, this waste oil has to be carted away, as it must not be put into public drainage systems.

### Construction

There are few special points in regard to the construction of multi-floor garages. Floors should have a specially hardened surface to eliminate dust as far as possible, and should be treated to reduce the possibility of skidding. Garage floors are often marked out in berths with white lines painted on the floors; such lines can be made permanent by inlaying the lines with white bricks or with different coloured (for example, black) cement strips. Corners of piers and cased stanchions, which are liable to damage, should have metal protection built into the corners for a height of about 3ft. 10in. above the floor.

### Car Washing, etc.

This is an important department in most garages and is usually placed either on the ground floor or in the basement. In up-to-date establishments rising and revolving car-lifts are used for easy accessibility to the undersides of the cars in conjunction with high-pressure water guns to speed up the process of cleaning. The floors of washing spaces should be formed of metal grids through which the water and dirt passes on to cement floors laid to falls discharging into proper gullies designed to collect petrol and oil. The metal grids allow workmen to stand on a comparatively dry and clean surface. The rotating car-lifts are generally 18ft. long for private cars and consequently need the area of a circle of 18ft. in diameter for their installation. The lifts are raised either electrically or hydraulically.

Adjoining the washing space should be several berthing spaces for waiting cars and for economy these may often be shared by greasing and oiling departments.

Rotating car-lifts are also installed for greasing purposes but sometimes alternatives such as raised tracks with inclined approaches or inspection pits are used. Lifts or racks with inclined approaches eliminate the use of inspection pits and tend to facilitate better work and service. Care has to be taken with raised tracks and similar fittings, so that suitable illumination is available for the undersides of raised vehicles.

### Repair Shops

These may be planned either in basements or on ground floors, but are seldom placed on upper floors except top floors. Badly damaged vehicles or those not running under their own power are difficult to move to higher floors.

Car lifts are also useful in repair shops so that the work in hand may be lifted to a comfortable working level. Inspection pits are still used in many garages and involve little upkeep cost and low initial expenditure as compared to lifts or raised tracks. It should be remembered that lifts require a clear height of 12ft. to 14ft. above floor level, as well as space below for the ram, whereas pits do not necessitate extra floor height but can only be used on the lowest floor. Work benches and machinery should have ample space and good daylight if possible, while the whole repair shop should be cut off from the garage itself by solid partitions and large sliding doors or shutters. If painting or cellulosing is to be undertaken, a separate department should be formed adjoining, but cut off from the repair room by fire-resisting partitions and doors, and should be approached from the external air. Motors and compressors should also be in a separate compartment cut off from the paint shop. Special ventilation is required for paint-spraying rooms by Board of Trade Regulations.

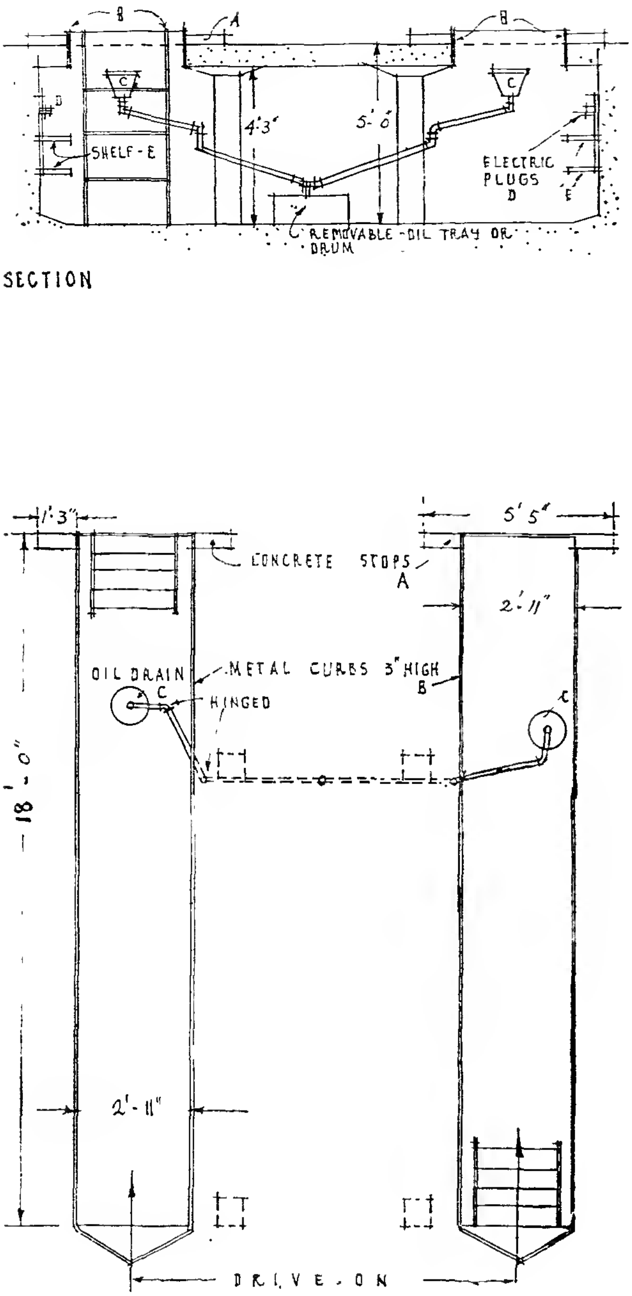
### Inspection Pits

Fig. 23 B illustrates the simplest form of pit suitable for private or small garages, or for occasional use in large garages. Except when in use, the pit is covered with lengths of timber about 7in. by 2in., each with lift rings, or battened together in sections about 2ft. 6in. long. The pit is a simple brick or concrete-lined sinking with a rebate to receive the removable flooring. Drainage should be provided.

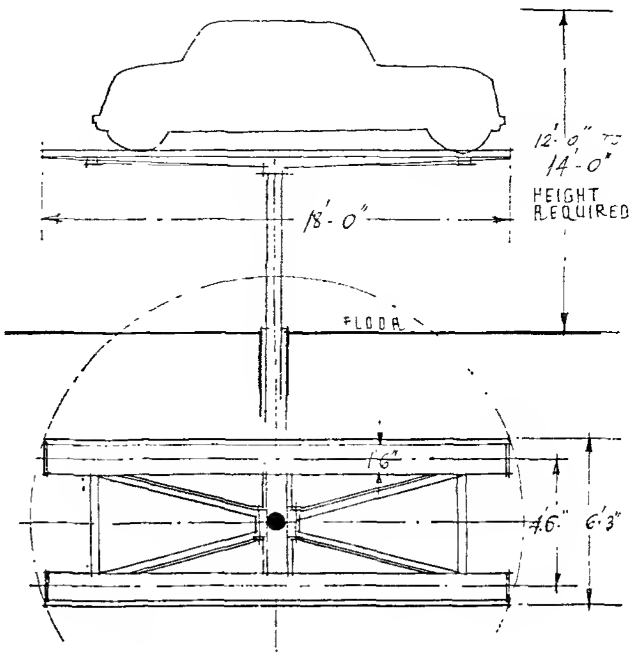
The width of a pit is dictated by the width of the track of the smallest cars, and is consequently 3ft. maximum; this is narrow, and difficulty is experienced in working under cars of much greater track widths; therefore, if two pits are being installed, one only needs to be the minimum width, and the other may be as much as 3ft. 8in. wide. The depth required for pits is fairly constant, since all cars are, within a few inches, the same height above the roadway to the undersides of the chassis; the usual depth of a pit is 5ft. below the floor level, which allows a man of average height to stand upright and work comfortably under a car. The bottom of a pit should have a slight fall to a drain for removal of water, oil, etc. It is an advantage to have a raised curb of metal fixed round the opening in the floor, and which projects, say, 3in. above it. This partially guides cars and prevents tools being kicked into the pit. It is advantageous to have the pit walls set back from the opening in the floor, as shown in Fig. 23 C, in order to provide space for tool racks, etc. Sometimes fixed artificial lights are installed in boxes in the sides of the pit and are arranged to throw the light upwards, thus illuminating the underside of the car; such a system avoids the possibility of electric shock, as the rubber insulated flex trailing from portable lamps may become perished by contact with oil. Fig. 23 C also shows a suggestion for flexible oil drains, which form a connection between a used oil tank and the sump of the car, thus facilitating its drainage. At the ends of pits fixed wheel stops should be installed of a sufficient width to suit the wheel track of the widest cars made, which is about 5ft.

An overhead runway track should be installed over all public garage pits for lifting and moving bodies, engines, etc., to benches or stands in other parts of the workshop or building.

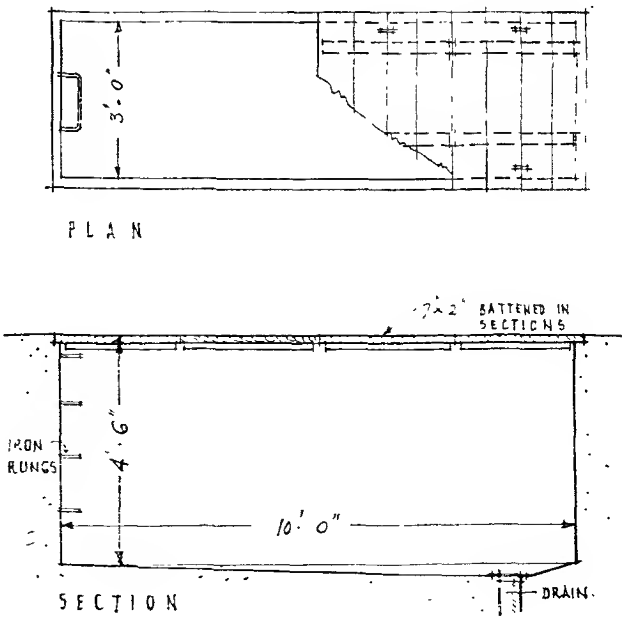
In Fig. 23 C two pits are shown placed side by side with the area between excavated, and left open for storage of tools, jacks, pressure-gauge apparatus, and general storage connected with the pits. For use with larger commercial vehicles, pits should be 18-20ft. long.




C ALL-PURPOSE INSPECTION PIT




A HYDRAULIC GREASE LIFT




B TYPICAL INSPECTION PIT

Fig. 23 Inspection pits and lifts

### Pumps

Petrol and oil used by road vehicles is now mostly sold through the medium of pumps. The compressed-air pumps are operated by applying air pressure to the storage tank, and the motor-operated pumps either by individual motors to each pump or by a central pump system. The discharge capacity of pumps varies from about 7 gallons per minute for hand-operated pumps to 20 gallons per minute for motor-operated ones. Pumps are made with single or multiple discharges up to six brands. Pumps vary in size and shape quite considerably and the type of pump should be settled before designing the size and shape of the kerbs, pavements, or bases upon which the pumps may be placed.

Fig. 24 shows typical petrol pumps and spacing. It will be found, however, that an island on which pumps stand should be about 3ft. wide, to allow space on which mechanics may stand without risk of being caught by moving vehicles. Islands, or bases for pumps, should be raised 6in. above driveways. Pumps are sometimes placed singly or in pairs. Pairs should be placed about 3ft. apart centre to centre and at least 6ft. should be allowed between single pumps or between pairs to allow further standing space both for mechanics and cars. The height of pumps varies according to type. Storage tanks for pumps must be placed either under driveways or may be enclosed tanks on the lowest floors. Tanks are usually of ungalvanized steel, cylindrical or rectangular in shape; they must be underground or enclosed in a fire-resisting container which will hold a quantity of liquid nearly equal to the tank capacity in the event of leakage. A manhole cover for access is necessary, together with a filling and a ventilation pipe, the latter carried up well above the ground and fitted with gauze covers. Tanks for petrol vary in size from 250 gallons to 2,000 gallons.

It is possible briefly to summarize the regulations made by the London County Council in regard to the storage of petroleum; these regulations are fairly typical of general requirements of other areas and of insurance authorities. If storage is above ground there must be an enclosing embankment or retaining wall forming a container 3in. higher than is necessary to retain the quantity of liquid to be stored; these walls have to be brick, stone, or concrete, of specified thickness and must be given foundations which will prevent leakage of oil; brick walls have to be at least 18in. thick. No openings, even for pipes, may be made in enclosing walls, and pipes have to be carried over the top.

If storage is to be in pits below ground level, walls must be suitable for retaining both the contents and the surrounding earth and must be given an additional height of 3in. If storage is within a building it must be on the ground-floor or basement level.

In many areas, pumps and filling caps must be at least 20ft. away from openings to buildings and from the public way. It is an advantage to place filling pipes in such a position that petrol tank-wagons may discharge without obstructing the normal traffic of the garage or pump station. In very few areas pumps are allowed inside buildings, or may be placed in set-backs under upper floors or under projecting canopies, which permit of the pumps and the operators being under cover in wet weather.

Hinged and flexible pump arms and pipes swinging across public ways should be avoided and, in fact, are prohibited in some districts.

### Site Considerations

The selection of a site for a filling station should be considered very carefully from the point of view of traffic in the surrounding streets and from the point of view of advertising advantages, as it is essential to be able to see a station some time before reaching it in order to have sufficient time to make a decision on the question of stopping.

The best sites for filling stations are frequently too expensive, consequently less satisfactory ones at low costs have to be used, with the result that site conditions are often very difficult. Town planning and traffic conditions, however, should be very carefully considered in order to avoid damaging amenities and causing traffic congestion, with the consequent avoidance of the station by motorists.

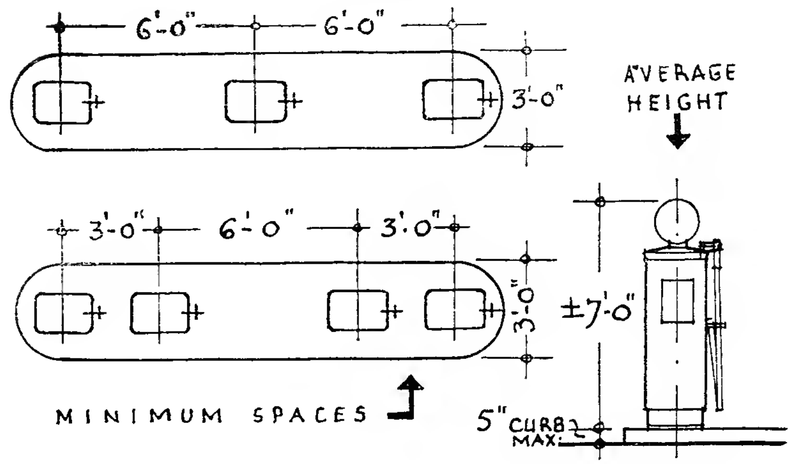
The important factors in the design of filling stations are quickness of service, elimination of danger to passing traffic, pedestrians, or users of the station, distant visibility for passing motorists and a clear view of passing traffic for those leaving the station. Thought should be given to the provision of opportunities for the display of accessories in showcases or windows and for the installation of a repairing depot with all stores and equipment.

Fig. 24 illustrates six typical filling station sites with their relationship to traffic in the adjoining streets. In regard to site planning those shown in Diagrams 1 and 2 are similar in relation to the streets, but the essential difference lies in placing buildings on the site. In Diagram 1 the buildings are towards the back of the site, leaving the front part of the site open, which is good from an advertising point of view and for visibility when entering or leaving the site; the fault, however, is that this type of layout is apt to become untidy in appearance unless the design is well handled and the premises well looked after. Type 2 has the advantage of having the road frontage partially closed by the station building. Traffic can circulate more easily on the site because the radii of curves are greater; but the visibility of passing traffic on the road to vehicles leaving the station is bad.

Diagram 3 illustrates two sites placed on the curve of a street. Site A is bad from the traffic visibility viewpoint as well as for advertising purposes, whereas site B is really ideal in every way because both traffic on the road and vehicles entering and leaving the station have a clear view of one another; also this site is very good from the advertising aspect as it may be seen from long distances before vehicles reach the station. Diagram 4 shows a good site for an important station at a road junction; the entrances and exits are easy in relationship to the traffic in all directions. Types 5 and 6 illustrate points which should always be avoided; in the former example the vehicles are discharged from the station in a position which is very disturbing to other traffic, especially if there is a likelihood of the traffic of one road having to wait for that of the other to pass; congestion is almost certain to take place.

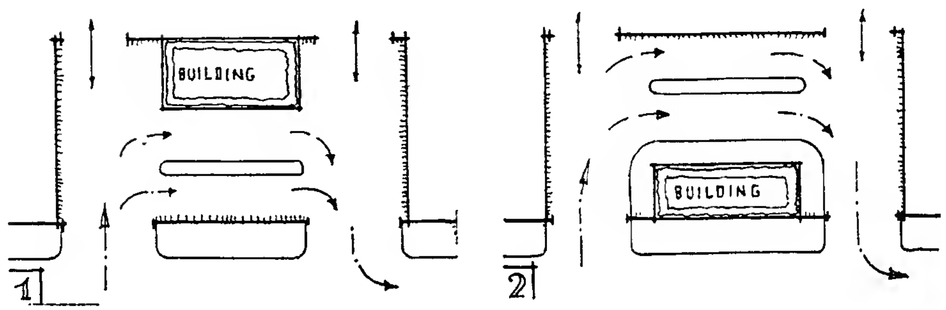
Type 6 is unsatisfactory as vehicles entering and leaving the cul-de-sac may obstruct one another and cause a hold-up to the main road traffic at the junction; also visibility of the main road traffic is bad for the cars leaving the station.

SPACING FOR SINGLE AND PAIRS OF PUMPS



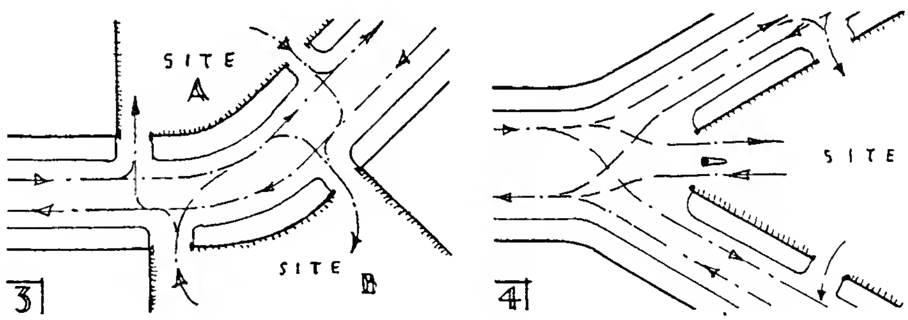

1 BUILDING TO THE REAR OF SITE

2 BUILDING ON STREET FRONTAGE




3 A POOR VISIBILITY
B IDEAL VISIBILITY

4 JUNCTION SITE FOR AN IMPORTANT FILLING-STATION




5 & 6 CONDITIONS TO BE AVOIDED AT STREET CORNERS

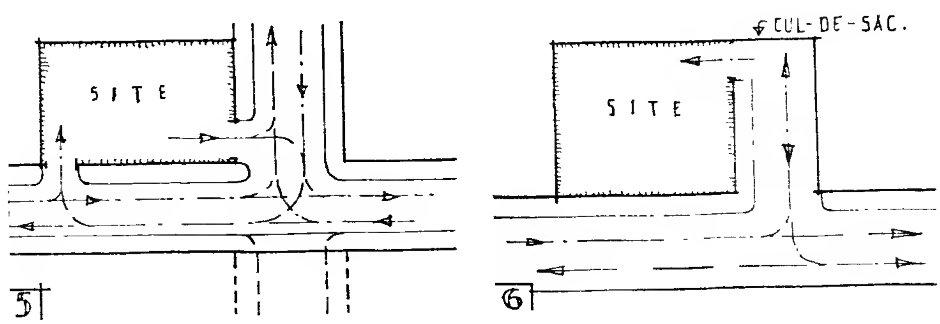



Fig. 24 Pumps; site considerations

PETROL FILLING STATIONS

**Planning the Filling Station**

These notes are confined to roadside filling stations and the information is not intended to apply to the sale of petrol connected with large garages, although many points are common to both. Important factors to be considered in planning of filling stations are, firstly, relation to surrounding streets (considered above); secondly, circulation and layout of roadways and buildings on the site together with the placing of petrol and oil pumps, thirdly, whether any sales are to be made in addition to petrol and oil, and if provision for the execution of repairs is to be made. Toilet facilities for both sexes should be provided, if possible, in all types regardless of size, although this is sometimes difficult to achieve in small stations in rural areas. Entrance roadways should be about 20ft. wide and driveways between buildings and pumps or between rows of pumps should be at least 12ft. wide. When planning driveways from the street to pumps, sharp curves must be avoided and consideration should be given to the turning spaces required for the largest cars and particularly lorries. Driveways must be constructed to receive heavy loads without damage to the surface; surfaces should be paved for cleanliness and ease of upkeep. The most suitable paving materials are concrete, asphalt and tar-macadam; they should be laid to falls to remove water quickly in wet weather. As previously stated, when the subject of pumps was under consideration, all pumps and buildings should be raised above roadway levels on islands with kerbs about 4in. to 6in. high to eliminate the possibility of damage. Canopies over islands and driveways are useful as a protection in wet weather, but care should be taken that the driveway on one side of the pumps selling purely commercial-vehicle grades of petrol should be left uncovered so that high lorries may use the pumps; the latter is a point frequently forgotten, and it is found that high-loaded lorries cannot approach covered pumps. Canopies should leave a clearance of 9ft. over driveways and should have supports of minimum dimensions to reduce obstruction of pavements. Toilet accommodation should have external approaches in small stations, but in large buildings where waiting rooms are provided the approaches may be from these rooms; it is better if the approach doors do not face the driveways or working spaces, although this is sometimes unavoidable.

Entrances and exits on main roads are better if separated, and should be very clearly marked.

Filling stations of this type seldom have covered driveways, but the whole island on which the buildings and the pumps stand might be easily and cheaply placed under one roof.

Figs. 25 B and C illustrate alternative schemes for the same site. The site is a normal roadside type with other property, either built-up or with open land on either side. Diagram B shows the buildings placed at the back of the site, and Diagram C with buildings adjoining the main road. In Type B the pumps are visible from the road; but this has to be well arranged and carefully kept up to avoid an untidy appearance; the petrol pumps must be set some distance back to permit of sufficient turning space for cars to draw up alongside pumps. Both schemes suggest covering one driveway but leaving the other uncovered for use of high vehicles. Scheme B has the advantage of having a suitable space—as shown on the plan by the pit—for the temporary parking of cars while small repairs are made without interruption of the traffic circulation; this space may be doubled if a garage is not placed behind the filling station and may in either case be covered if desired. In both examples, petrol pumps, water and air supplies, may be placed on an island between driveways, while oil may be stored in bins placed under cover in front of the office. Alternatively, in Type C air and water supplies may be separated from the petrol at the back of the site, thus causing less interference with petrol pump users—especially if tyres need attention which may take some time to carry out. The buildings provide similar accommodation, but the toilet facilities are better in Type C, the entrance doors for men and women being separate.

Type C has a show window on the street, but its value is somewhat doubtful and, excepting for the fact that attention may be drawn to the station by means of a large sign on the roof of the office building, a station where the pumps are mostly hidden from the road by buildings does not attract the attention of the passing motorist very easily.

Fig. 25 D illustrates an example of the treatment of a station placed on a corner site. The building is placed on the diagonal of the site with driveways passing on each side of it; if the building is placed more forward on the site it obstructs the view of traffic on the main road. It is important for entrances and exits to the site not to be placed too near the corner, as they may interrupt the easy flow of traffic in the street.

This plan also provides a building at the back of the site, and parking space for a repair shop with good access to driveways.

Fig. 25 E illustrates a type of filling station plan in which the buildings, pumps and protective roofs are placed at right angles to the street on which the site abuts. Such an arrangement produces a very compact building, which is easy and economical to construct, organize and maintain; it should be placed sufficiently far back on the site to allow space for large commercial vehicles to draw in easily to the outside of the first row of pumps, which is the only driveway not roofed over. The office is conveniently placed for service both to the pumps and to the repair department, and at the same time has full control of the approaches to the station from the street. The toilet rooms are well placed, being convenient but not too prominent. This plan, when placed on a rectangular site, as in the illustration, leaves ample room at the back corners for car parking and washing, as well as for such repairs and oiling as are not executed under the cover of the canopy.

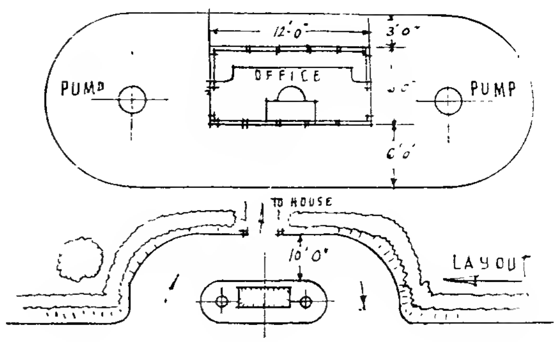
The corners of the site may also be used for store rooms, compressors and lighting-plant rooms—an arrangement which keeps these units well away from the normal traffic areas. It is also helpful to have such back spaces for tank lorries bringing petroleum supplies to stand while they are discharging their load into the storage tanks which serve the pumps.

Fig. 25 A illustrates the " wayside station " often attached to a cottage in outlying areas, and is, consequently, very small, providing only the minimum accommodation in the form of buildings, together with one or two petrol pumps. The office building is just large enough for a desk and one

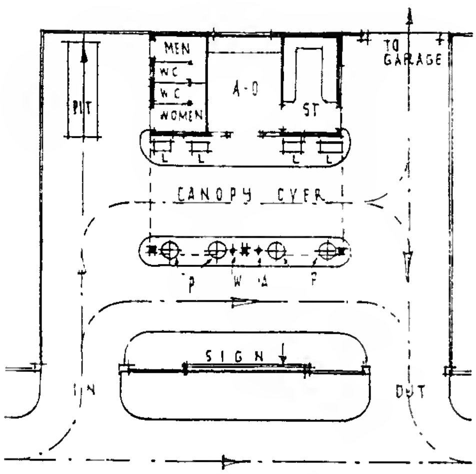
# Garages and Parking Spaces

## PETROL FILLING STATIONS

P · PETROL PUMPS
L OIL PUMPS
A · AIR POINTS
ST · STORES
S · SIGN
B PARKING BAYS
W WATER
AO ADMIN OFFICE
R ROADWAY

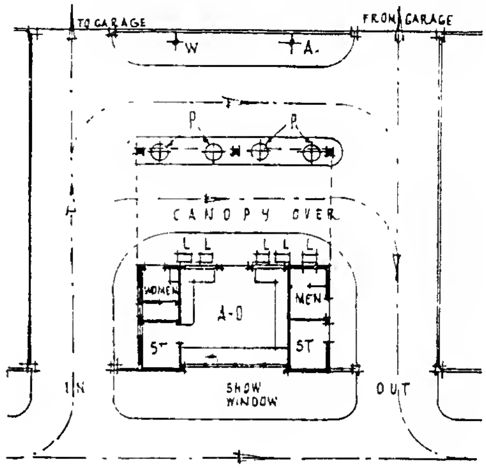



A A WAYSIDE FILLING STATION WITH ADJOINING HOUSE

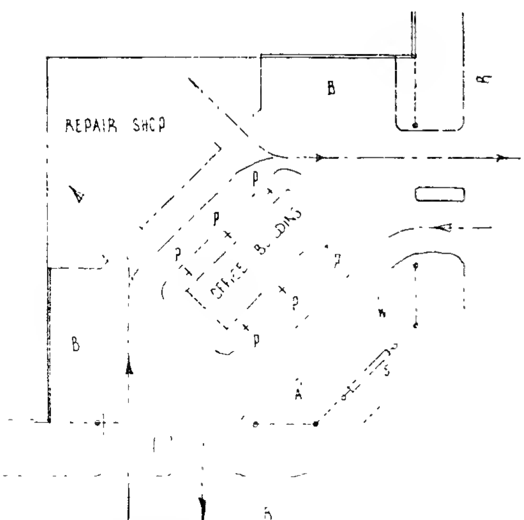



B A FILLING STATION WITH BUILDINGS AT THE REAR OF THE SITE

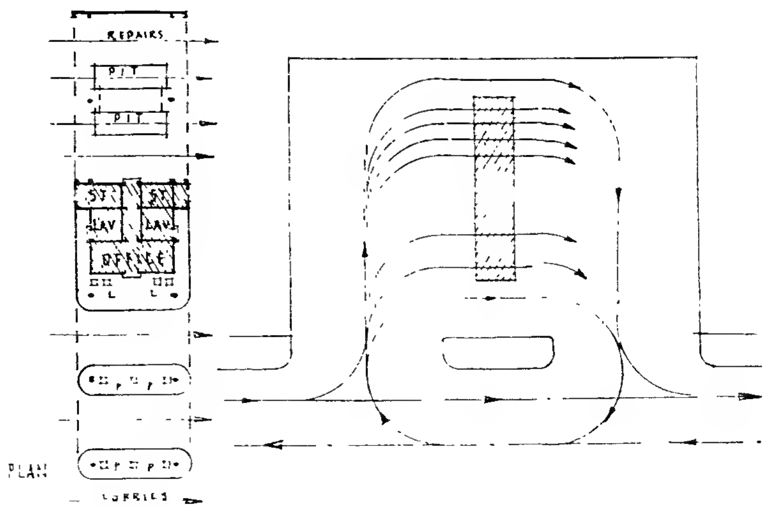
Identical sites - two different planning solutions




C A FILLING STATION WITH BUILDINGS AT THE FRONT OF THE SITE




D FILLING STATION ON CORNER SITE




E STATION WITH BUILDINGS PLACED SYMETRICALLY AT RIGHT ANGLES

Fig. 25 Layout of petrol filling stations and service garages

or two chairs, and has accommodation for storage of a few tins of oil, etc., but no space for spare parts or accessories. A water point is necessary, although this may only be a pump or a tap fed from a storage tank filled by a small pump.

The positions illustrated for the pumps are well separated so that two vehicles may stand one on each side of the island near each pump.

### Canopies

In most districts canopies are not permitted over the public highway or footpath, but this does not affect use on land in private ownership. It is a great advantage to have both pumps and those parts of the roadways on which vehicles stand during the process of filling, covered during wet weather so as to keep both the station employees and customers dry.

The canopies may take either the form of flat or pitched roofs, according to the design and locality of the station, but it is generally easier to collect and remove rainwater from flat-roofed types, as falls may be laid to supporting piers or to the building against which down-pipes may be placed. It is difficult, however, to connect a down-pipe against the pier of Type D in Fig. 26 to an eaves gutter. It is very desirable that the water be collected and not simply allowed to drip off the roof on to vehicles or customers. Fig. 26 illustrates several types of sections through canopies; Type A is a roof placed between a building and a row of posts placed on a pump island, thus one driveway is covered and the other open for use by high vehicles, as the overhang is stopped slightly behind the face of the kerb to the island; this extra overhang does, however, provide protection to the pumps. When cantilever types are designed it is essential to bear in mind that they must either be properly tied back to a building or be balanced by similar loads. Types B and C show canopies covering two driveways; in Example B both are placed on one side of the office, and in C one roadway is on each side of the building. The positions of pumps in relation to buildings and canopies are shown in each example; it is important that supply connections between pump and vehicle do not have to cross one traffic-way to reach another. In Example C it should be specially noticed that pumps have to be duplicated on each side of the building. Accessibility of the pumps is of the utmost importance and is the primary factor in planning the layout of a filling station; quality and rapidity of service are important, but count for much less in the eyes of a casual user of a station than does a simple and well-arranged layout.

The maintenance of the good appearance of a station may be facilitated by the proper designing of surroundings such as lawns, flowerbeds and trees. Signs and lighting are of the utmost importance because they can aid the commercial value of a station very considerably and must be designed as part of the whole scheme, which should have an appearance of efficiency, clean lines and tidiness.

### Lighting

Most stations are likely to be used after dark and should have good artificial lighting both as an attraction of custom and to ensure efficiency and safety of operation. Lighting should be concentrated on the vital parts of the station such as the pumps. Driveways and approaches should have the same or a greater amount of light than the streets from which the vehicles enter the station.

One authority recommends the following intensities of light for different purposes; pump islands, pits and general working space, 15 f.c.; yards, approach roads, 3 f.c.

The proper diffusion of light and the proper placing of fittings in relation to work surfaces such as benches, pits, etc., are essential.

The exterior lighting of the building as part of the attraction to passing vehicles may be carried out in a number of ways, such as flood-lighting, outlining of the building, and by use of street lighting units or lamps on tall standards.

Glare, and lights shining directly in drivers' eyes, must be avoided. The use of bare lamps is usually unsightly and uneconomical, especially if used to outline buildings. Canopies should have ceiling reflectors to light all covered areas.

Display cases, showrooms and offices should have adequate lighting of the types suitable for each purpose.

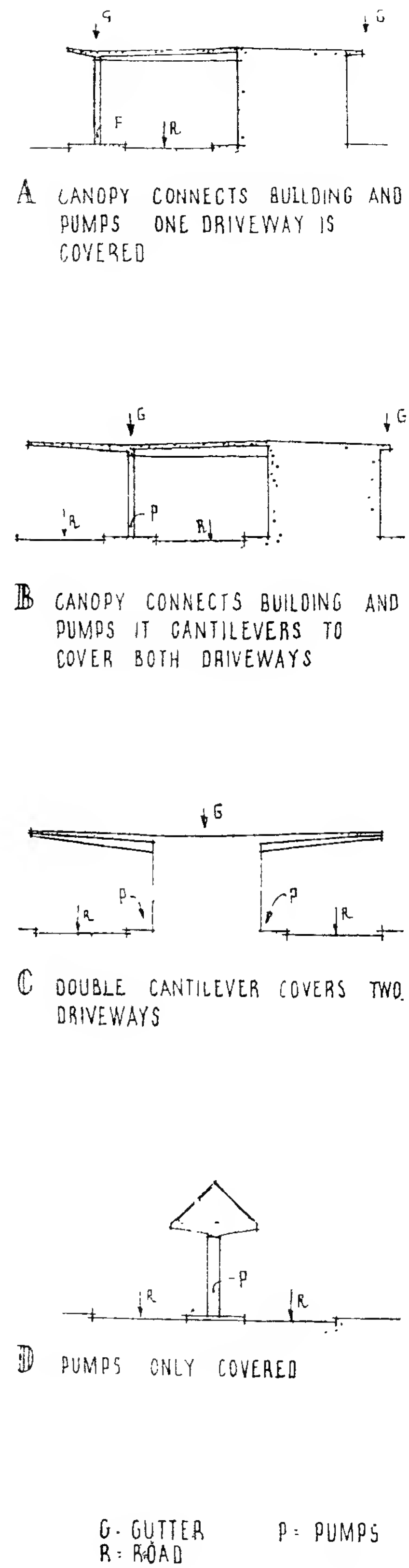



Fig. 26 Canopies

**Signs**

Signs are an essential part of the design of a filling station and must be properly considered as part of the lay-out scheme and in the detail of the building. Signs have to indicate the existence of the station, its name, entrances and the type of petrol sold. Main signs should be visible at least 200yds. before reaching a station.

In some districts regulations have been made controlling the use and design of signs, more especially sky-signs and those which overhang the public highway. Placing is of the utmost importance, especially as regards their height above the ground. If too high, signs are difficult to see from the modern type of motor-car. Equally, if signs are too low, visibility may be obstructed by pedestrians and other vehicles.

Signs must be designed both for day and night use. The amount of lettering should be reduced to the minimum and be well-spaced. The size and lettering depend on the position of the sign and the distance from which it will generally be read. Signs which are very large are often difficult to read. Each brand of petrol should be properly marked so that the driver knows where to go and signs bearing information or instructions for drivers should be placed near eye-level on the drivers' side of the vehicles.

Filling stations frequently have restaurants or tea rooms attached to them, or the filling station is part of the services of a wayside hotel or road-house. The design of these restaurant buildings is outside the scope of this section, but there is one essential additional factor which does not have to be considered in ordinary filling stations, namely the provision of a large area of parking space which must not be so placed as to impede other traffic entering and leaving the filling station itself.

## Introduction

The proper planning and construction of farm buildings has received more thought in recent years. An increase in related research is proceeding rapidly and better and more reliable information should gradually become available. Two extremely helpful publications are published in the "Post-war Building Studies" series, namely No. 17 *Farm Buildings* (H.M.S.O. 1945, 3s.) and No. 22 *Farm Buildings for Scotland* (H.M.S.O. 1946, 1s. 6d.); other useful publications on many farm building matters are available through the Agricultural Land Service of the Ministry of Agriculture and Fisheries and from the Milk Marketing Board.

The buildings of the farm, apart from those housing the farmer and his staff, fall broadly into three main groups: housing of livestock, including milking and dairy buildings, crop-storage with food preparation and implement storage. The first of the groups needs the most detailed consideration to obtain efficiency in stock management as errors both in planning and construction may be detrimental to the well-being of the animals or dangerous to those who tend them or to the public consumer.

A most important factor influencing the planning of farm buildings is the very variable building requirements since, owing to the nature of the soil, the concentration may be on arable, dairying, livestock fattening or horticulture. Customs and methods also vary in different parts of Great Britain and even the sizes of buildings are affected by the varying sizes of breeds of animals.

It must be borne in mind that a farm is in many ways similar to a factory in that proper planning to suit the processes involved is of the utmost importance as also is the need for absolute economy in first cost, operation and maintenance.

The planning of farm buildings, as of all buildings, depends for efficiency on properly arranged circulations. There are numerous circulations in the farm and these have to be related to one another and to external factors such as approach roads, animals, their food, their produce, their wastes; crops and general supplies are constantly moving into or away from the farm or from one part of it to another, so that poor planning and relationship of units may cause continual waste of time and labour.

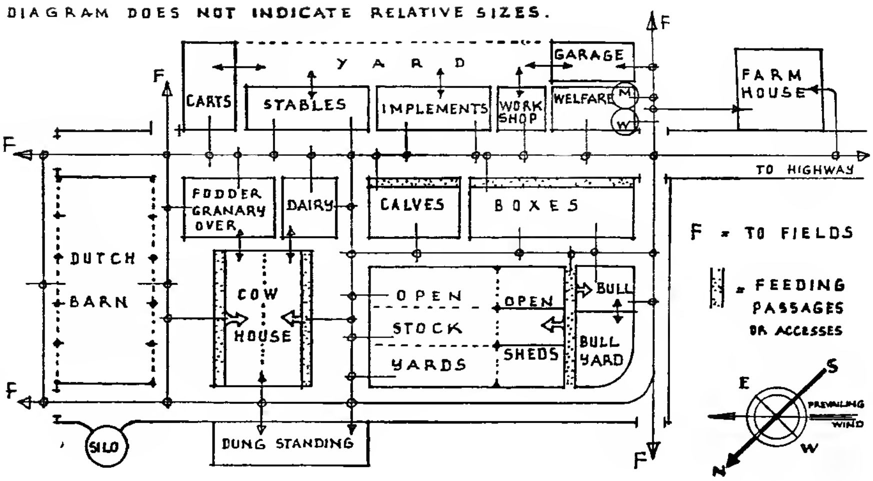



**Fig. 1** A typical analysis plan for a "mixed" farm

Fig. 1 is a diagram showing typical relationships and circulations for a general farm. It is gradually being realized that by properly planned circulations it is not necessary to have dirty conditions throughout the scheme.

Other general considerations relate to access for delivery and removal of crops and fodder, which necessitate road surfaces negotiable by wagon or lorry with suitable manoeuvring space; storage for field implements so arranged that these can readily be withdrawn or replaced singly at will; passage of animals to pasture for feed and exercise without danger or loss of control; and planning of buildings so as to secure for livestock the maximum protection from cold winds and a sufficiency of unobstructed sunlight—chiefly from south and west.

The last-named condition is usually satisfied by disposing the range devoted to storage and preparation of fodder so as to run east and west along the north side of the yards and buildings housing livestock.

Under modern conditions it is not unusual to obtain further protection by disposing a range of Dutch barns or haysheds parallel to the last-named range with a roadway common to both dividing them. This shed being full when cold conditions obtain and empty during early summer, can well serve this double purpose of storage and wind-screen. Since a portion at least of its crop-content will be fed to stock, it is also thus conveniently placed in relation to fodder supply arrangements (*see* Fig. 2).

## Site and Surroundings

As with every other type of building, the ideal arrangement is usually rendered impracticable by external influences. All such factors as proximity of other buildings, direction of slope, prevailing wind, existing road access, situation of arable and grass fields, water and drainage facilities (and these singly or in combination), must be considered in relation to most schemes for new buildings or additions to existing ones.

## Necessity for Clear Programme

Few architects can have the opportunity of becoming skilled farmers, any more than they are skilled doctors or theatrical producers. Nevertheless they succeed in designing very satisfactory hospitals and theatres, both tasks which call for more complex planning and arrangement than the most extensive set of farm buildings. The relevance of this statement lies in the difficulty often experienced in obtaining from farmers and land agents commissioning buildings clear instructions embodying their intended manner of use. Farmers in particular are apt to assume that all they know of right relationships between the component parts is (a) common knowledge, and (b) the only possible solution. Farming aims and methods, even in this small country, differ from district to district so widely that there is none which can be described as standard, and it is of the utmost importance that anyone starting to plan or adapt buildings (particularly buildings for stock)

should obtain a clear idea of the routine which is followed throughout the day and at all seasons.

As instances of the wide divergences of practice a few specific cases may be quoted. In the potato-growing districts of Lincolnshire it is necessary to provide rat-proof storage for a considerable bulk of seed potatoes, and a special glasshouse known locally as a " chitting house " in which these may in due season be exposed to light so as to encourage shoots. In some of the corn-growing districts it is the custom to take advantage of the presence of thrashing machinery to chaff sufficient straw to supply this fodder ingredient throughout the winter; this necessitates a special apartment known as a " chop-house " or " cut-house " for its storage. Instances could be multiplied but others will emerge later in these notes.

### Buildings for Livestock

This group comprises housing for cattle, with the associated dairy buildings, pigs, sheep, horses and poultry. Close relationship of the units of this group to food stores and bedding stores is essential also; in some instances easy access to and from the fields. It is also necessary to consider stock units in relation to methods of removal of waste products, the position of dung standings and the place of manuring—again, the fields.

### The Cowhouse Site and Surroundings

A cowhouse should be so placed as to receive as much light (and particularly sunlight) as possible, and should not be closely involved with other farm buildings. It should occupy a dry situation, with shelter from prevailing cold winds or south-westerly gales, according to which manifestation is most troublesome in the district. A single-range building is best placed with its long axis east and west, the cows' heads facing north. A double-range house is preferably laid out north and south, so that sun reaches each long side at some time in the day.

A clean and convenient access for cows to pasture, if possible without traversing a public road, and direct and sheltered ways from fodder-mixing floor, and for the passage of milk to the cooling room, are all essential.

### Essentials of Plan

In all but the smallest cowhouses it is desirable to have three ways of access; one for cows to enter and leave and for manure to be taken out, another from the fodder and mixing room, and a third for the passage of milk to the cooler or dairy. The latter should be either detached or, if part of the same range, approached only from the open air and not by doorway directly from the cowhouse. A covered lobby is, however, convenient. If more than 15 cows are to be accommodated, or if extension is a possibility, the double-range form offers advantages in economy of cost and of traffic. Farming opinion has long debated the relative advantages of tail-to-tail and head-to-head placing in double range houses, but the former is now generally advised. Cows' heads are thus kept near to the sources of fresh air, and dung is confined to one passage.

The most recent legislation lays down no regulation as to space or cubical contents, and the official view merely stresses the importance of clean approach and good lighting and ventilation. Previous to 1926, when the Milk and Dairies Order came into force, there were regulations which stipulated 600cu. ft. per cow in most areas, and 800cu. ft. in towns, where cows were not turned out for part of the day. These rules are now obsolete, but may be found in force in a few county boroughs which have their own Local Acts.

The most complex of the circulation puzzles which attach to farm planning is that relating to the cowshed intended for tying up a milking herd, and Fig. 3 illustrates the different routes involved. In the single rank house (when other circumstances favour) it is possible to separate the four essential services, but when double-ranking begins at least two of the routes must cross, so that it becomes a question of combining those least affected by each other—say, incoming fodder and outgoing milk.

In dairying practice circumstances have combined to render the big tie-up cowhouses less popular, and to cause many farmers to organize their milking procedure on the basis of the milking-parlour or lactory, to which cows are drafted in batches from covered or open yards or from pasture fields according to season. This system, which calls for some ingenuity in planning, if in and out circulation is to be arranged with easy working, has been highly developed by the firms who produce mechanical milking equipment, and by one or two independent specialists.

### Dimensions

In calculating dimensions 3ft. 6in. width should be allowed for each cow, and no more than 12 cows in line (in a double-rank house) without a cross gangway equal to the width of one standing. The transverse dimensions of a cowhouse depend on various factors, such as whether feeding passages are required, whether standings are single or double, and breed of cow. Fig. 4 gives several examples. Feeding passages do not seem popular in the north of England and in Scotland where the climate is colder in winter. Average standard dimensions for the several divisions are as follows:—

| | |
|---|---|
| Feeding-passage (if provided) | 3ft. 0in. |
| Mangers or trough | 2ft. 6in. with side ties<br>3ft. with central ties |
| Standing | 5ft. 0in. |
| Dung channel | 3ft. 0in. |
| Rear gangway (single rank) | 4ft. 0in. |
| Rear gangway (double rank) | 5ft. 0in. |

Single rank house 17ft. 3in. or 14ft. 6in. by omission of feeding-passage.

The minimum width for a double-rank house based on the above figures is thus 33ft., feeding-passages nearly always being found a necessity in this type. The 5ft. dimension for length of standing is an average one, some types of cattle requiring 5ft. 3in. and others 4ft. 9in. or less, but it is safer policy to adopt the average in deciding the width of the house, as this permits freedom in choice, and adjustment can be made at the expense of the dung channel. It should be realized that the shorter the standing can be made without inconvenience to the cows, the more easily they will be kept clean, which is one of the principal aims of cowhouse design.

All the dimensions given above, except width and length of standing, can be increased by a few inches with possible advantage, but, in the case of the space allowed for the standings, increase will be actually detrimental by allowing cows freedom of movement which might result in the fouling of their standings.

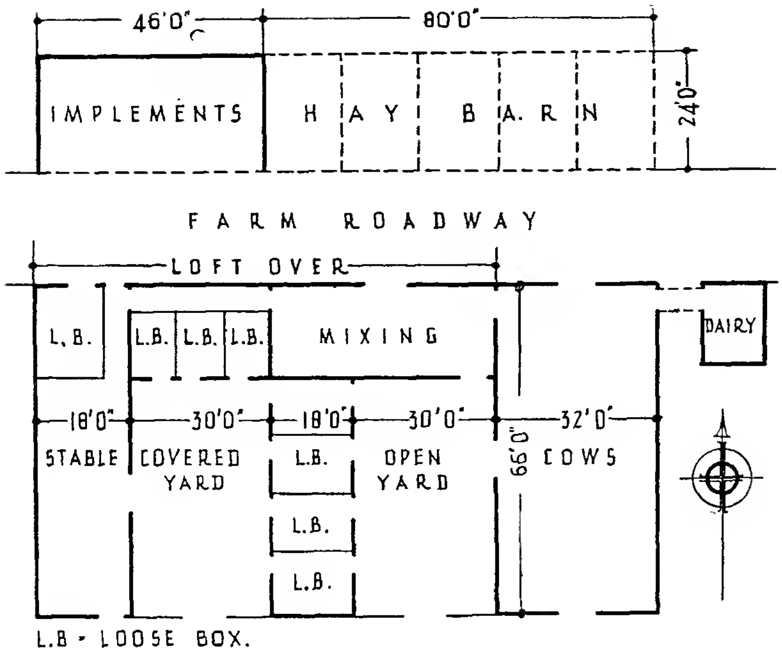



**Fig. 2** Barns and main buildings, etc.

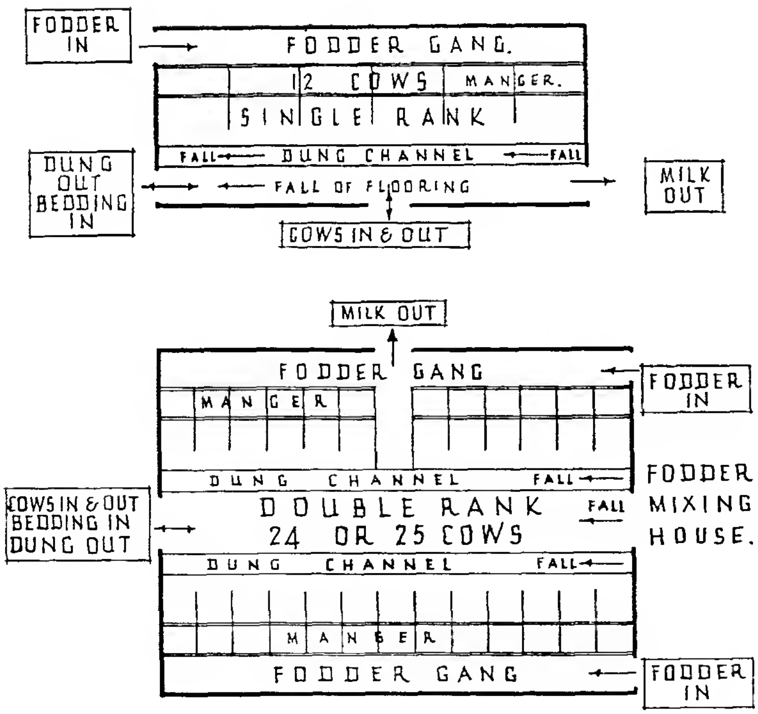



Fig. 3 Cowsheds

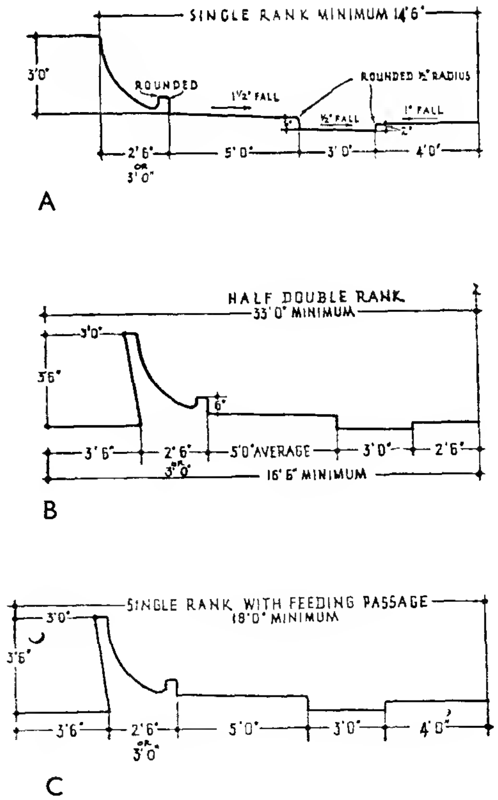



Fig. 4 Cowstandings

BUILDINGS FOR LIVESTOCK: COWHOUSES

### Details of Standings

The dimensions and falls shown on the cross-section Fig. 5 are the result of experience, and should not be varied. The shape of the manger is that found suitable for yokes or close-tying; the slope of the standing is the maximum which permits comfort to the cow; the height of the rear step discourages a cow from standing with its hind feet in the channel, and raises the standing sufficiently to minimize splash thereon; the width of the dung channel ensures the cows stepping in it when entering the standing (a narrower channel might be jumped, with dangerous possibilities); the back step reduces splash on the rear gangway.

### Stall Divisions

Stalls may accommodate one or two cows, the latter arrangement allowing rather more freedom to the milker when hand-milking is practised, but single standings, that is, a division to each stall, are usual when stanchions are used for securing cows. All solid divisions tend to impede free circulation of air, and to create angles difficult to clean; for this reason galvanized steel tubular divisions are usually preferred.

### Tyings

The aim of any system of tying is to secure that a cow should stand and lie as nearly as possible on the same ground; therefore, only two systems are virtually possible—the yoke system in one of its forms, or close-tying by double chains, as shown in A and B in Fig. 6 A yoke system with stanchions necessitates a feeding-passage, since access to the manger from the front is impeded.

### Feeding Troughs

In order to preserve equal height to steps, manger, etc., throughout the length of a cowhouse, it is usual to give a common inclination to the complete floor and manger structure in the direction of the drain outlet. Outlets should be provided from the dung channel at intervals not greater than 50ft. (in the form of cross-channels if the total length exceeds), and the fall to the outlet may be either in one direction or both ways as the ground suits. To facilitate manger washing, drainage outlets from the lowest point should be provided. If it is desired to partition the trough between animals so as to prevent poaching of rations, hinged galvanized iron divisions, which can be raised to free the trough for cleansing, can be supplied by the makers of divisions, stanchions and similar fittings.

### Light and Ventilation

An area of at least 3sq. ft. of lighting surface per cow is desirable, but much more is all to the good. Strong light should fall on the hindquarters of the beasts, with good general lighting everywhere. Roof lighting has more effective value than windows, and is essential over the centre gangway of double-rank houses. For windows the hopper type, falling inwards between solid cheeks, combines light and ventilation suitably. Outlet ventilation should be provided near the apex of the roof, either by opening lights, good windows in the gable ends, or other means. Open louvres unprovided with any means of control are not a satisfactory means of ventilating a cowhouse.

### Structure

While any of the orthodox methods of building—brick or concrete walls and roofs tiled or slated—is appropriate, economy often dictates a slighter form of building, and with judgment and discrimination a perfectly good cowhouse can be constructed mainly of timber and asbestos cement or bituminous sheeting. It may be observed that in the double rank "tails in" house, animals and dung only make contact with the walls over short lengths of the end walls, so that if these are made resistant there is no real objection to a timber structure, which should, of course, be mounted as usual on a brick or concrete base. Alternative sections are given in Fig. 7. The height of the side walls need be no greater than that of the doorheads—about 7ft.—and the roof design will naturally depend on its covering. The tendency for dripping to arise from internal condensation on a cold roof surface must be recognized, and measures taken to avert it. A flat roof with clerestory lighting, covered with bituminous sheeting on boards is one method (A); a pitched roof covered with asbestos cement sheets is another (B). In the latter case condensation may be prevented either by adequate ventilation between eaves and ridge, or (with greater certainty) by an underlining of insulating wallboard.

A scheme of structure which spaces roof trusses 10ft. 6in. centres—equal to three cow standings—is usually convenient, and a purlin roof without common rafters suits either method best. Principles of light steel construction offer less harbourage to dust than wooden trusses.

In the construction of floorings, insulation from cold ground is necessary, and is readily afforded by an underlayer of coarse hard core, say, 8in. thick or more, beneath a minimum thickness of concrete. Other means sometimes adopted are a layer of hollow clay blocks or land drainpipes beneath the raised standing. The floor surface in the house—if of concrete—should be smooth in the dung channel and manger, and slightly roughened on standing and gangways: lightly scoring with a stiff broom gives as good a non-slip result as anything.

Several methods of contriving a standing which shall form a warmer cowbed than bare cement are current, but all at increased cost. The standing may be paved with cork asphalt or similar bituminous preparations, either laid *in situ* or in blocks, or it may be covered with doubled asbestos cement flat sheets embodying an air-space.

It is worthy of note that although all salient angles should be rounded, those forming the arrises of steps should not be overdone—a radius of ½in. is enough.

### Unorthodox Provisions

It is not every farmer who will desire to keep his cows in a tie-up milking house. For one reason and another he may prefer to keep them largely in the open or in covered yards, with a milking shed smaller than would accommodate his full herd, to which cows are driven for milking solely. The spread of mechanical milkers favours this practice, which in its most advanced form employs a moveable "milking bail" which travels about the pastures where the cows graze in the open throughout the year. Only in districts where the land (chiefly downland) will not "poach" under the feet of cattle in wet seasons, is

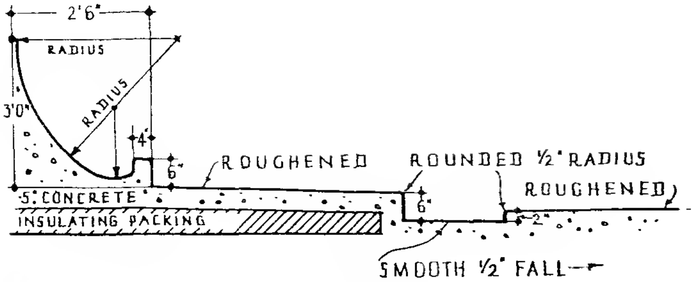



Fig. 5 Cowstandings: heights and finishes

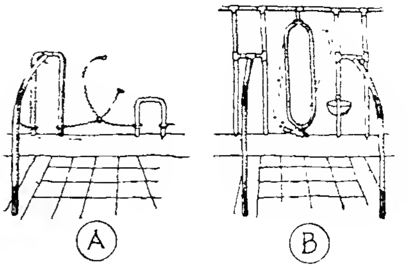
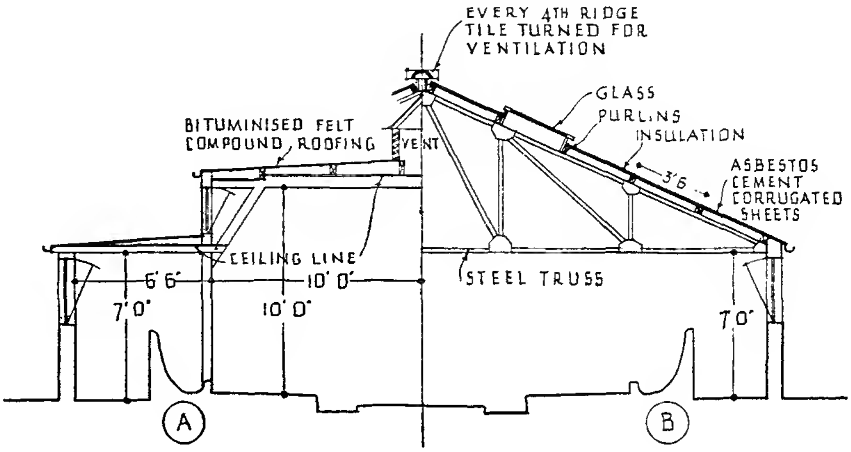



Fig. 6 Ties: cow ties

Right: Fig. 7 Cowshed sections



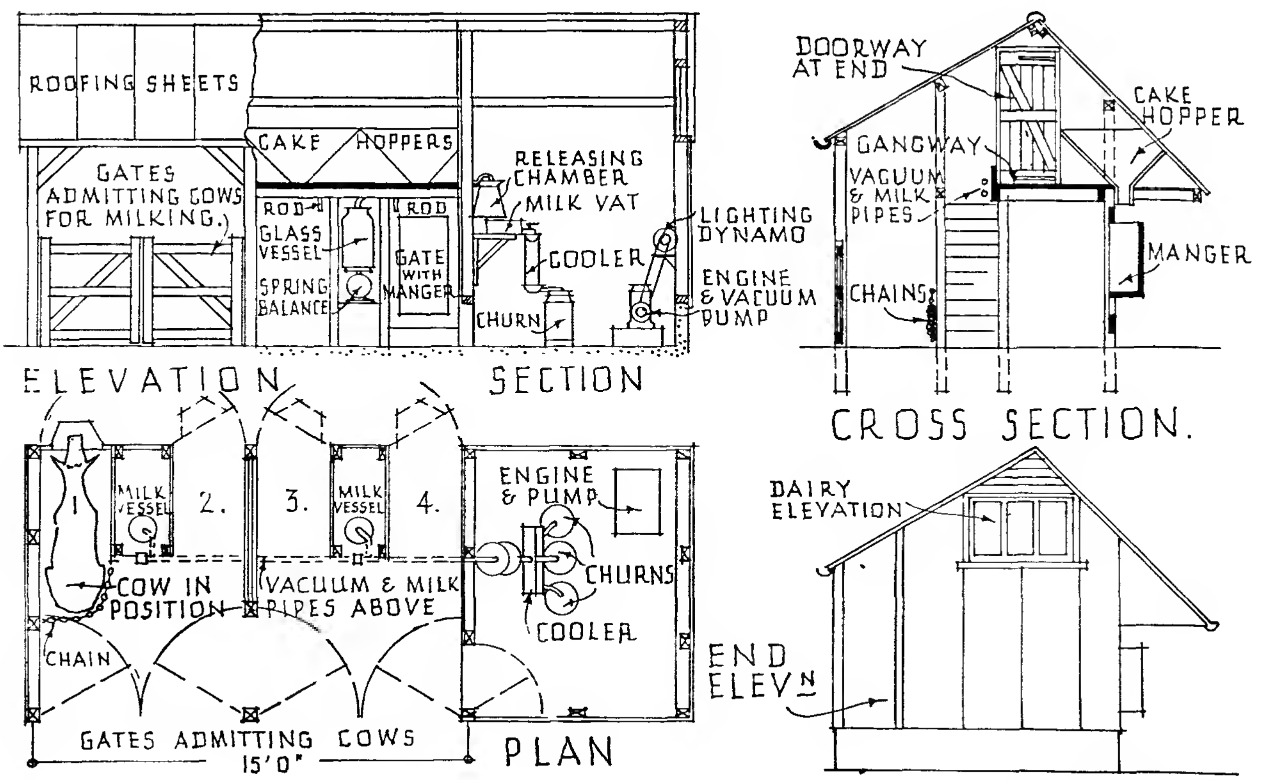




Fig. 8 Mechanical milking

this method practicable, but the small milking bail, as an alternative to the more expensive cowhouse, is a possible expedient almost anywhere.

Under this system, shown in Fig. 8, animals enter stalls by gates at one end from a collecting yard, they are retained by a chain across the entry, and fed with cake while thus tethered for milking.

After milking, each cow is released by the operation of the manger-gate at the forward end of its stall, this being actuated by a lever-rod under control of the single attendant. Cake is admitted in measured quantity to each manger from hoppers in a loft gangway above, also by the operation of a rod.

The milk is drawn off by suction attachments and conveyed first by tubes to sealed glass containers between each pair of stalls, where it can be automatically weighed and recorded. It is then passed (by means of a special valve) to the cooling house without handling, and thence through the cooler to churns or other receptacles placed ready.

One milking unit (holding two cows) is capable of dealing at each milking with fifteen cows, and two units (holding four cows) constitute the smallest economic scheme, capable of milking thirty cows. A higher number, up to sixty cows, can be run by a man and a boy, and shows perhaps the maximum economy.

In planning for this system, it is well to remember that a collecting yard may be provided for waiting cows, but those liberated after milking should find it possible to proceed directly to their shelter sheds (in inclement weather) without further attention. Gates and passageways so used should not exceed 4ft. in width—otherwise cows may turn and impede the circulation.

Many variants utilizing existing yards and buildings are possible, and will differ according to circumstances. A number of alternatives is illustrated in the publications before referred to, and a specimen example is given here. (*See* Fig. 9.)

### Dairy

A proper milk room is a necessary adjunct to any cowhouse from which milk is sold, whether it is cooled and sent away in bulk, or bottled and retailed. The room, with its ancillary accommodation, should be close to, but not connected to, the cowhouse, and may be under the same roof (Fig. 10) or detached (Fig. 11). Milkers should not enter the milk room, but should pour the contents of their pails into a receiver (removable for sterilization) delivering by a pipe through the wall to the cooler in the dairy. This entails a stepped platform to give the necessary height, and in connection with this a desk or bench for recording is useful. There should also be a glazed panel which will enable milkers to look into the dairy before pouring. Up-to-date practice includes hand-washing provision for milkers, and facilities for the keeping of clean overalls.

### The Milk Room

The milk room should be used for no other purpose than cooling and despatch of milk, and the storage of sterilized equipment for so doing. It should have an impervious floor and dado—trowelled cement is best, and a floor-hardener helps the life of paving —and should be ceiled and have wire-gauze fly protection to windows. There must be no internal drain inlets. Any racks for storage should be non-absorbent—stout galvanised tubing is the best material for everyday use. A room 10ft. by 8ft. suitably planned will suffice for cooling and despatch of milk from a herd of fifty milking cows —rather more space is requisite if bottling is to be done, and a bottle store is also desirable (Fig. 12). Large establishments also include a cold store for bottled milk, which necessitates the further provision of space for a brine pump and compressor. In the plan this provision is shown above the fuel bunker, occupying the space below the roof gable. It should, of course, be separated from the boiler and fuel by dust-tight divisions.

### The Washing-up and Sterilizing Room

The washing-up and sterilizing room should be approachable from the dairy and also from outside, as it will have to deal with equipment from both sources. It will contain usually a steam chest for sterilizing portable equipment, and this should be large enough to contain the cooler.

Other fittings are a steam-jet or block on which churns may be inverted as well as tanks or troughs for washing and rinsing. Steam for sterilization, and abundant hot and cold water are required, and where low-pressure steam is used hot water is usually obtained by blowing steam through a nozzle into cold water.

A chest 4ft. by 3ft. by 4ft. will usually suffice to deal with equipment for a herd up to forty or fifty cows, and two tanks or a galvanized double trough 4ft. by 2ft. 3in. by 1ft. 6in. will allow the necessary washing to be performed; if bottling is done a rinser must be added, increasing the length by a further 2ft. or so. Usually this equipment is supplied by specialists. Stoneware or fireclay sinks are unsuitable, and fail to stand up to heavy use. The steam block is a pedestal about 6in. high, having a steam jet and two valves.

It is usually convenient in small and compact outfits so to arrange relation of boiler (in adjacent compartment) that apparatus requiring live steam stands adjacent, as shown in Fig. 10 and in Fig. 11.

Economy in space is sometimes achieved by recessing the sterilizing chest (which is apt to be somewhat obstructive in a confined area) so that only the front and door is in the wash-room, the chest itself projecting into the boiler-room at a height of 4ft. above the fuel bin.

Wooden troughs, shelving, or racks should be entirely excluded, and floor and wall finish may be similar to the dairy. Top ventilation is desirable for escape of steam.

In larger establishments duplication rather than increased size of apparatus is preferable.

### The Boiler Room and Fuel Store

The boiler room and fuel store may also serve usefully as a drying room for the outdoor clothes and boots of workers. Vertical steam boilers of $1\frac{1}{2}$ to 2 h.p., suitable for dairy purposes are supplied by specialists. Oil-fired types are available, and, for general cleanliness, particularly where electric generators must be housed in the same compartment, offer advantages. Good artificial lighting is (or should be) an important factor in convenience of cowhouse and dairy equipment, much of the work through several months of the year being necessarily done during hours of darkness.

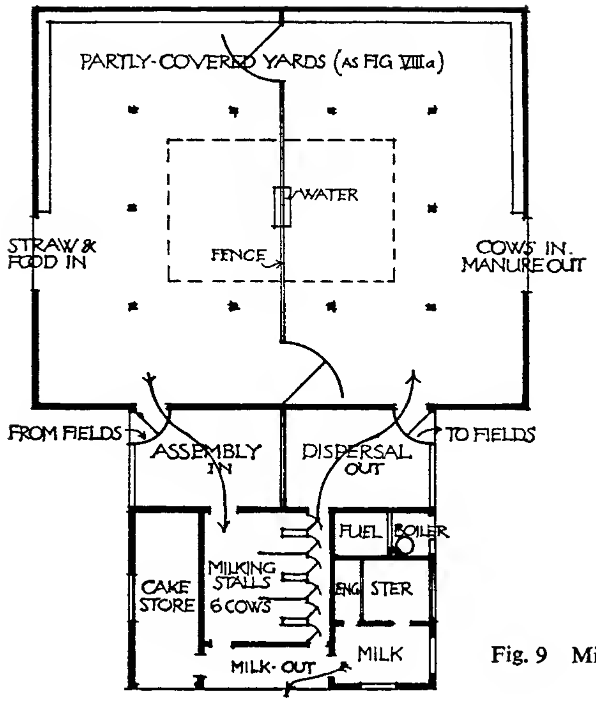



Fig. 9 Milking unit for 40 cows

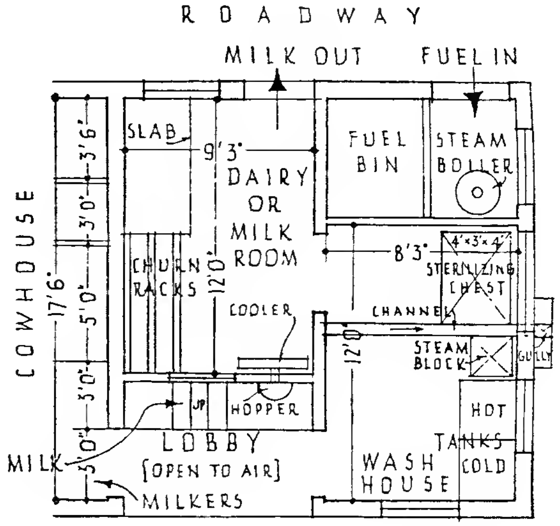



Fig. 10 Dairy attached to cowhouse

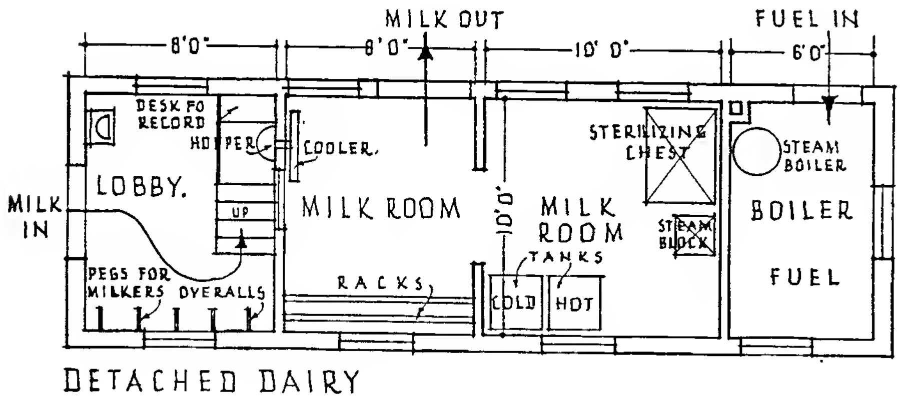



Fig. 11 Detached dairy

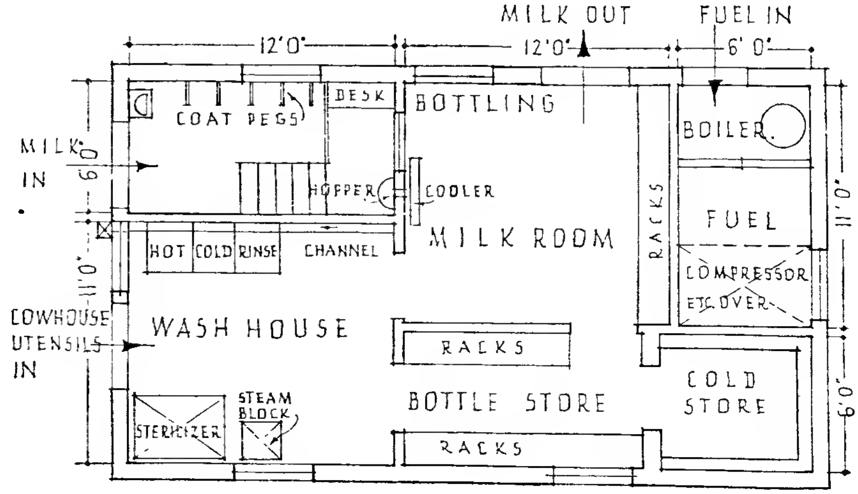



Fig. 12 Alternative detached dairy

## BUILDINGS FOR LIVESTOCK: CATTLE SHEDS, CREW YARDS

### Cattle Yards

The covered fold-yard in which cows are wintered, in conjunction with the milking-shed last described, should be calculated on a basis of about 100sq. ft. per cow, with a minimum dimension in any one direction of about 24ft.—a yard 60ft. by 24ft. should accommodate fourteen or fifteen untied cows. Such a yard is valuable for "making" manure, a process which depends upon the combination of straw or other bedding, with dung and the treading of cattle. Provision must be made for exclusion of cold winds, which means that any sides not surrounded by buildings (or the whole circumference if free-standing) must have a close fence about 6ft. in height. Light and ventilation must not be excluded, and this is arranged by allowing an open space of about 2ft. between fence and eaves, or, where the yard is bounded on three sides by buildings, by an increased opening at the free end, which should face south. A suitable example is shown in Fig. 13. A solid base-wall of at least 2ft. in height should be allowed for " muck " to accumulate during the season. For roofing such a yard no material is superior to creosoted spaceboarding, which admits an appreciable amount of light and air, and is both cool in summer and warm in winter.

A similar yard serves also for fattening bullocks, or for the keeping of any store cattle under the best conditions. It should perhaps be said that one of the purposes for which all cattle are kept is the production of " muck ": this aspect has equal or greater importance than the direct profit which may be gained. Rain water—at any rate in excess—should be excluded from a cattle yard, which it should be possible to run without drainage, the liquid arising from the cattle being absorbed by the bedding material, which is frequently supplemented by new layers.

### Open Yards

In the districts where arable farming is practised, it is usual to maintain a considerable herd of beasts, which are confined in open yards surrounded by buildings, one or more of which take the form of shelter-sheds open to the yard, and containing a manger. Such sheds should be at least 14ft. in depth and 7ft. to the eaves; the latter dimension is likely to be reduced by 2ft. as the yard level rises with trodden " muck." The yard bottom should be stoned and dished, with a 3ft. sq. grated catch-pit for drainage. From thence a straight drain at least 6in. diameter should run to a second deep catch-pit outside the yard to trap solids and sediment, and thence by 4in. drain to an outlet. All cattle-yards should have drinking troughs supplied, if possible, by ball-valve in locked chamber forming part of the trough, or by gravity from a levelling tank.

A form of partially covered yard which has been found successfully to combine the advantages of shelter and sunlight is illustrated in Fig. 14. It has been found that ascending warm air from the cattle and manure tends to rise through the central opening, so preventing excessive down-draughts of colder air. No arrangement so far devised however seems to offer every advantage, and in this type of yard the delivery of fodder and removal of muck present difficulties—particularly if mechanical muck-clearing is intended.

Purely grass dairy farms need a different type of yard—the assembly yard for cows, used previous to milking or for turning out tied cows to air during winter; this is a clean yard, paved, drained, and frequently scavenged.

### Field Shelters

Field shelters or " off-buildings " with or without fold-yards are usually required on farms of any extent, situated in grass fields distant from the homestead. These are intended as a refuge for grazing stock, or may be used to house fattening stock in such position that they will consume fodder stacked nearby and make " muck " close to the land which needs manuring, thus economizing labour in cartage both ways. These shelters are commonly closed to the north, east and west, but open to the south, and their detail and dimensions are similar to the cattle sheds already described, though often they are of slighter construction. The most useful type embodies a loose box at one or both ends, as shown in Fig. 15, as this provision may be used to confine a sick animal, or as a store for fodder. Loose boxes should be floored in concrete, the open sheds need no floor.

### Loose Boxes

These omnibus provisions are useful for many purposes; for the secure housing of any stock—horses, cows, pigs, calves, or even poultry—as well as for certain specialized uses such as calving or foaling, for segregating a sick animal or a new acquisition under precautionary observation; sometimes as a chaff-house. No farm building is complete if it does not comprise at least one large loose box, say 12ft. by 14ft., though 12ft. by 16ft. is better, as giving greater facility in drawing a calf or foal. Smaller boxes down to 12ft. by 7ft. in size are also useful for a single animal, for calves or young pigs, or on occasion for a pair of cows. The furniture of a loose box is simple—a wide half-door, say, 7ft. by 4ft., light and ventilation in moderation, and a manger which preferably is adaptable to various types of stock. The simplest device of this kind is to fit two corner cribs, one about 1ft. 6in. to the chin rail for cows or bullocks, and the other 3ft. 6in. for horses. If smaller livestock is introduced, portable troughs can be used. Brick or concrete floors with a fall of 1½in. in 10ft. towards door or outlet, but without internal drain gulley (soon blocked) are most generally suitable.

### Bull Pen

The bull is sometimes tethered to a stall in the cowhouse, but preferably given greater freedom in a special pen adjoining. This should have a size of about 10ft. by 12ft. with stout tubular enclosure and strong gate.

### Calving Box

The calving box, sometimes called the maternity pen, may be somewhat similar, but of greater size—12ft. by 15ft. allows space for working.

### Calf Pens

Calf pens for weaned calves should allow manger space about 1ft. 6in. in width per calf, with divisions to check food poaching. Many farmers believe that calves do better if they are placed in positions where they can be interested in nearby activity! The plan shown in Fig. 16 gives a suitable relationship of the parts of a large-scale dairying set of buildings. The cow pens shown therein are intended for cows with new-born calves, and the range labelled " young stock " (which is generally similar to the cowstandings) would stand either young heifers not yet in milk, dry stock, or barreners. Such buildings as this are common in Canada and U.S.A. though, owing to our large amount of solidly built and obsolete equipment which we cannot afford to scrap, less common in this country.

## BUILDINGS FOR LIVESTOCK: CATTLE SHEDS, CREW YARDS

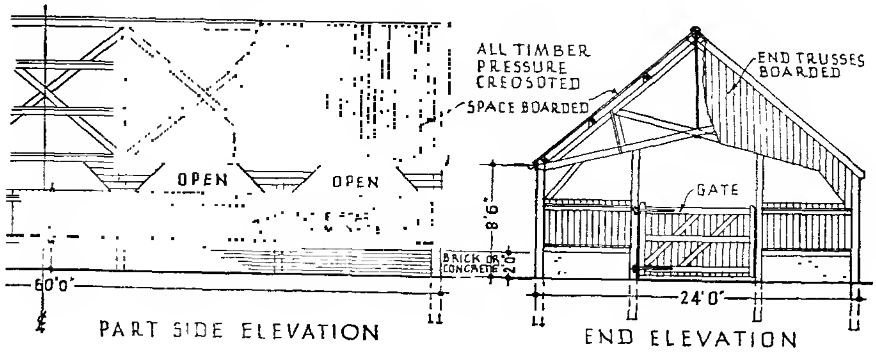
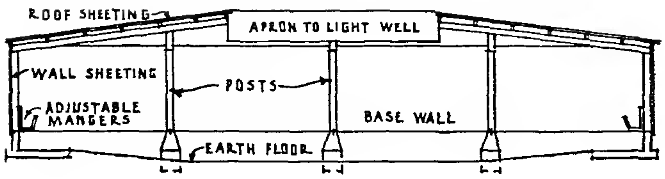



Fig. 13 Covered cattle yards

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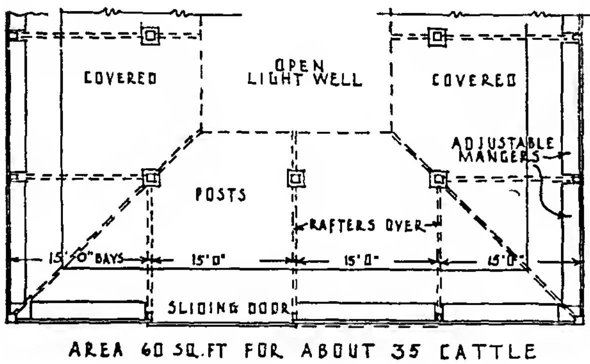



PLAN

Fig. 14 Covered cattle yards

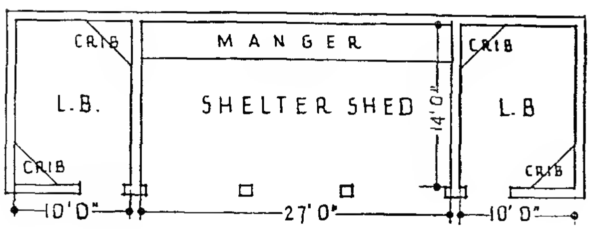



Fig. 15 Field shelter

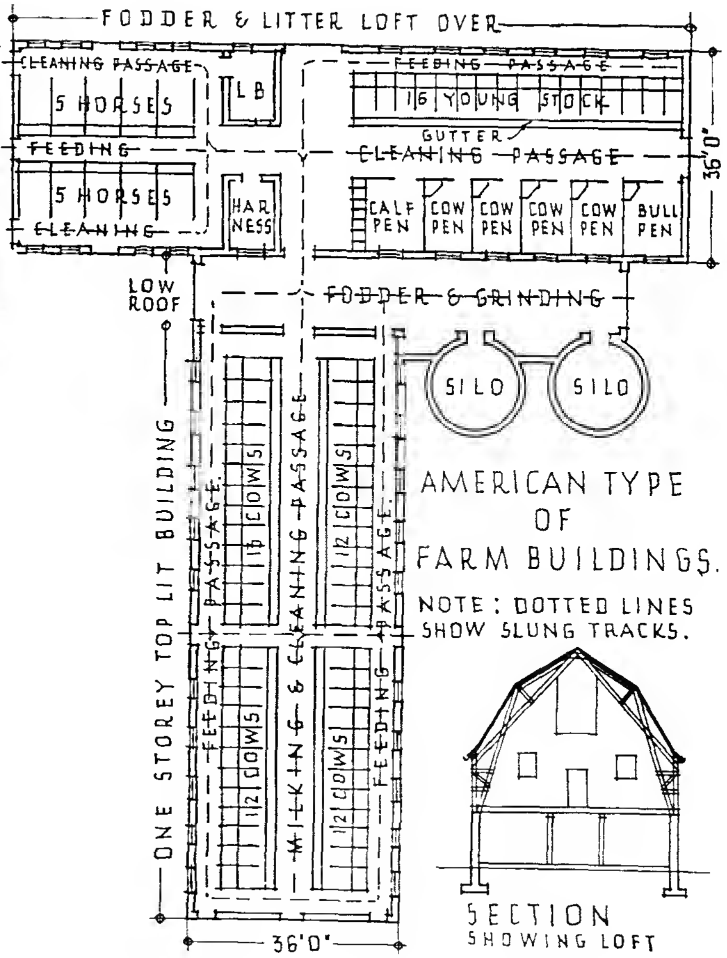



Fig. 16 North American type

## BUILDINGS FOR LIVESTOCK: PIGGERIES

### Types of Piggery

In deciding on the scope of buildings intended for the breeding and fattening of pigs it is necessary to ascertain whether the aim is to keep a few pigs as a supplement to other farm stock—perhaps chiefly as a means of converting waste products, such as whey and vegetable cast-offs, into marketable produce—or whether pig breeding is to be a chief industry, as with many Scandinavian farms. The former class of stock may be sheltered in loose boxes, covered yards, etc., available in turn for other animals, with perhaps a few farrowing pens; the latter class is best provided for by a fully equipped pighouse specifically intended for its sole purpose.

Two other forms of equipment for pigs hardly fall within the scope of these notes, namely, the open-air system and the cottagers' piggery, though the suitable arrangements for this latter type are shown in Fig. 17. Special points to be noted thereon are:—

(1) Doors to sties so placed that pigs will lie against the internal division wall.

(2) Door to pen so placed, that the yard is traversed diagonally. This results, in effect, in greater cleanliness, as dunging and feeding can take place (and usually do) clear of interference.

(3) Roof pitched away from yards, preventing flooding by damaged or overflowing gutters and giving height for more than a creeping door on the front, which should face south.

(4) 6-ft. high doorways available for sunlight and inspection, with upper half to a level below pen fence closable at will by a half-door for increased shelter.

(5) A check step down from sty to pen, to prevent the entry of surface water.

(6) Pen paling put on from inner side to prevent pigs from gnawing rails or forcing off the boarding. In all but the coldest districts this boarding can be spaced ¾in. apart (more may enable pigs to gnaw or dislodge), by which means the air circulation and dryness of the pens are materially increased.

### Indoor Piggeries

A simple type of pighouse suitable as part of the equipment of a mixed farm is shown in Fig. 18, and requires little explanation. The detail of combined pen fence and feeding trough is given in Fig. 19. This arrangement is less cumbersome and seems as convenient as the better-known swinging shutter.

The Scandinavian type of pighouse, which in a modified form has attained some popularity in this country, is a more highly organized affair which requires some explanation. In the plan, Fig. 21, the building is divided into two parts (of which the left is incompletely shown) by a central driveway open to the roof, from which fodder and bedding can be unloaded to the extensive lofts covering the pens, valuable when full for their insulative value.

The portion on the right contains (as well as the fodder-mixing room and a central heating stove) the breeding accommodation. This comprises a boar pen, a large farrowing pen divisible as two ordinary pens, four pens for sows with litters, each having in connection a smaller pen reached by a creep-hole in which piglings may be fed. There are also two weaning pens facing south and open to as much sunlight as possible.

The portion on the left consists of fattening pens to which litters of pigs, after weaning, are transferred. These pens are graduated in size, so that pigs may be moved along as they grow, arriving at the largest pen when ready for market. The trough length is the real measure of the capacity of a pen, since it is this dimension more than the depth of the pen which counts.

Throughout the house the arrangement embodies a central feeding passage and outer dunging passages. These latter communicate with the pens by openings 1ft. 9in. in width, closed by a door the full width of the passage when dunging-out is in progress, but open to the pen when the door is closed across the passage, thus dividing the pens from each other. These passages must be wide enough to allow pigs to turn; say, 3ft. 9in. for full-grown porkers. They serve also another purpose—as circulating ways for the weight-recording business by which pigs pass to and from the weighing pen.

British practice usually omits the loft and the heating stove (perhaps unwisely), and quite often restricts this type of equipment to the fattening house planned as on the left of Fig. 21, providing for boar and farrowing by more ordinary means such as normal loose boxes or pens.

### Construction

It may be noted that a house of the type shown in Fig. 21 is of a width which would permit conversion to a normal double-range cowhouse, which, in view of the mutability of agricultural prospects, may be a useful precaution. Condensation of moisture and coldness of floor, roof and wall surfaces are evils equally to be avoided as with cowhouses, and may be countered by adequate insulation.

### Light and Ventilation

In the double-range piggery last described, if a loft is formed, lighting is restricted to the walls and virtually the whole length of the two long sides (which should face east and west) will need to be windowed. If no loft is formed, continuous roof-glazing or a series of skylights can be formed above the centre gangway.

Ventilation should be ample but controlled. Hopper lights in the upper part of windows, eaves and ridge ventilation in the roof, and air inlets near paving level along the side walls (so arranged as not to coincide with the openings from dunging passage to pens) are all desirable. The latter should be grated so as to exclude rats.

### Drainage

Open channels alone should be allowed inside the buildings, with outlets to external gulleys, entering below the gulley gratings. The deep, narrow form of the drain channels in the dunging passages and their position against the walls are planned to prevent pigs from reaching any liquid therein, which in times of thirst they may be tempted to drink.

An arrangement which may be preferred to the narrow internal channel shown is the formation of an external channel running along the projecting concrete footing of each side-wall with outlets at relatively frequent intervals. The outlets, however, must be effectively baffled to avoid draughts and to exclude entry of vermin, by heavy metal flaps.

Drainage should be conducted to a liquid manure tank and not allowed to escape to any watercourse, for the dual reason that it is valuable as a fertilizer and noxious as a polluter of running water.

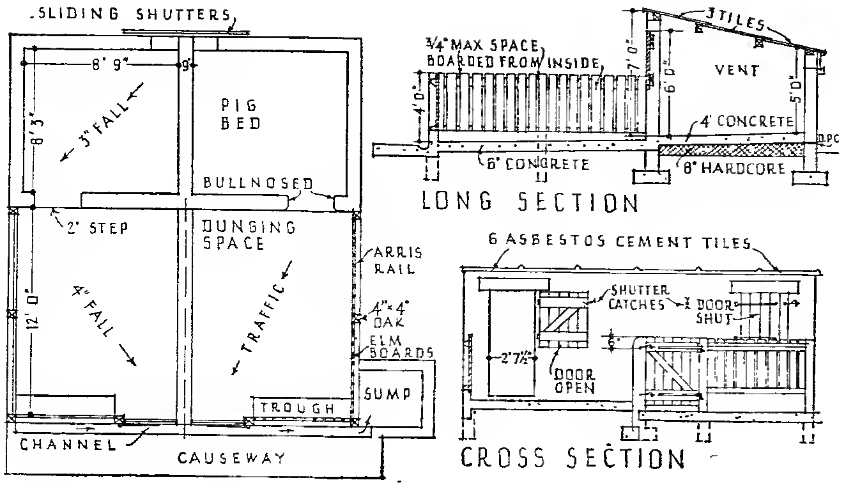



Fig. 17 Cottager's piggery

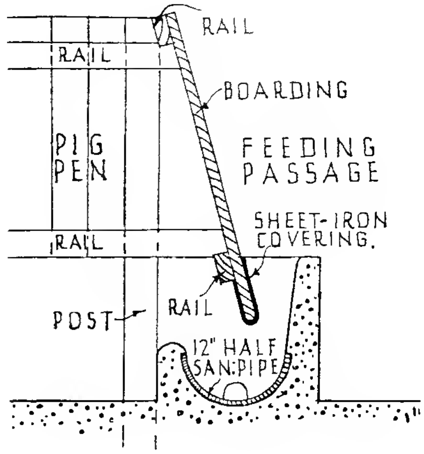



Fig. 19 Pig trough

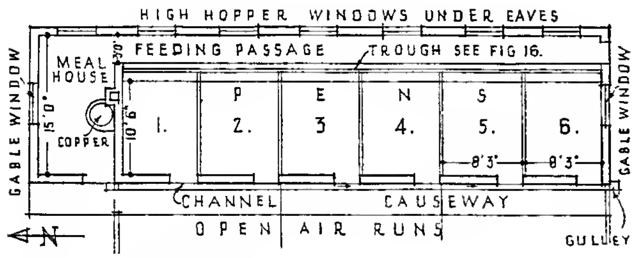



Fig. 18 Farm piggery

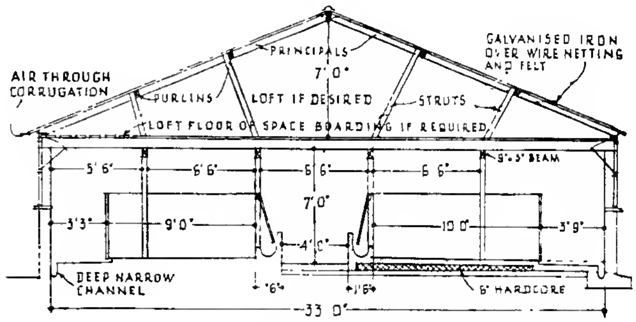



Fig. 20 Scandinavian piggery: section

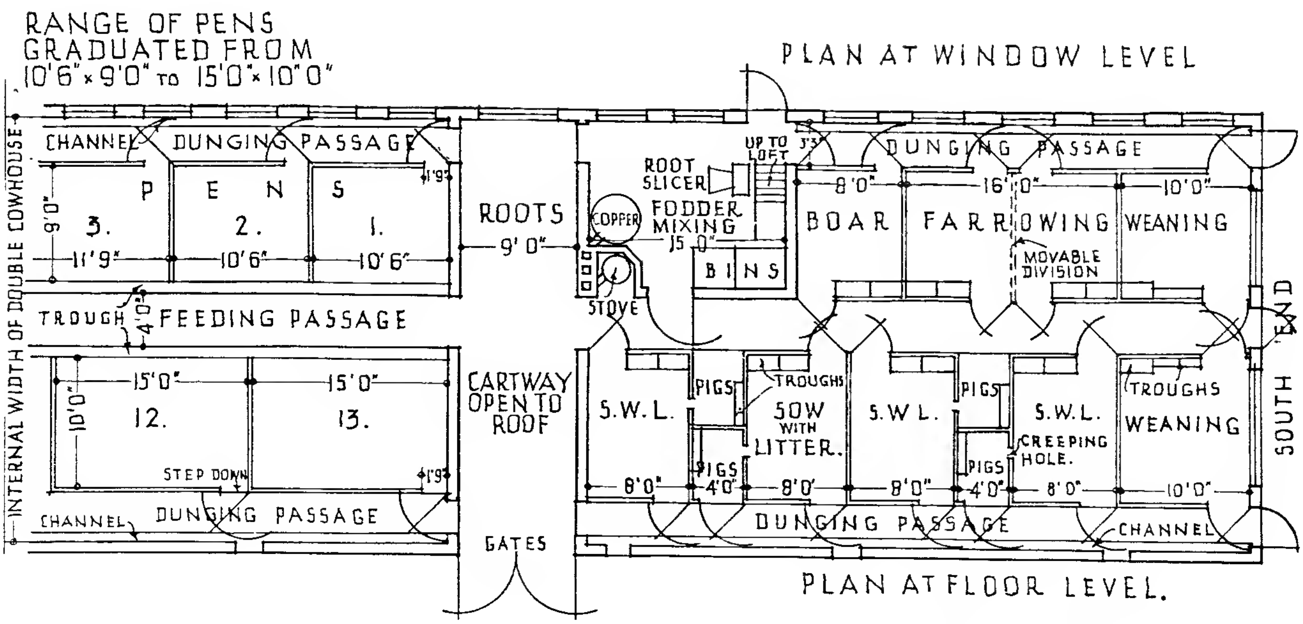



Fig. 21 Scandinavian piggery: plan

### Stables

Stabling for a few horses will no doubt continue to be provided for some time on some farms.

The width of standing proper to a heavy draught horse is generally agreed as 6ft. The actual space occupied by a horse with room to lie and rise may be taken as 6ft. by 9ft., and where a stable accommodates two horses only and the doorway is placed centrally behind them a depth of 14ft. is just enough. With more horses in rank, involving the necessity of passing behind stalled animals, a minimum of 16ft., with a desirable excess over that, should be planned. See Fig. 22 A and B.

The furniture of a stable consists of stall divisions, manger and hayrack, for which suitable provision is shown in Fig. 23. The hayrack is sometimes preferred as a continuation of the manger—that is, the chinrail continuing at one level, but the manger interrupted halfway in the alternative form shown in Fig. 24.

Stable floors require special attention, as (particularly under the horses' hind feet) they are subjected to heavy pounding and abrasive wear. Drain gulleys are better placed outside, channels being led to them by cross channels passing the gangway if an end wall is not available.

Harness and gears in big establishments are best provided for in a separate harness room, where they will not be in contact with the alkaline vapours of the stable; but where space cannot be afforded, stout wooden brackets, firmly built in or otherwise secured, may be placed behind the rear gangway.

Windows should not face the horses, but should preferably be high in the rear wall. Roof lights (even glass slates or tiles) make a valuable supplement to the main source of light and air, which is the upper half of the usual half-hack door.

Stable doors come in for rough usage, and the following provisions should be observed. Size should be 4ft. wide by 7ft. high, frame out of 6in. by 3in. (at least), well cramped to walls, and dowelled at foot, with all arrises rounded and brick jambs bull-nosed up to 6ft. high.

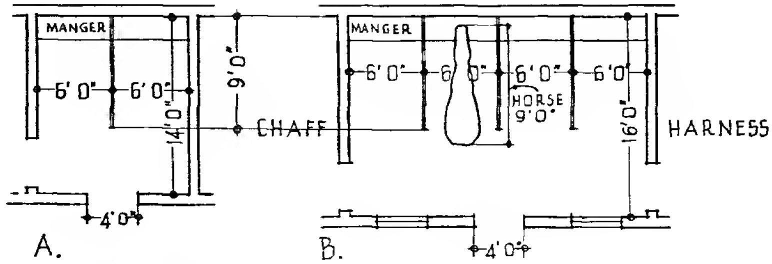



Fig. 22 Stables

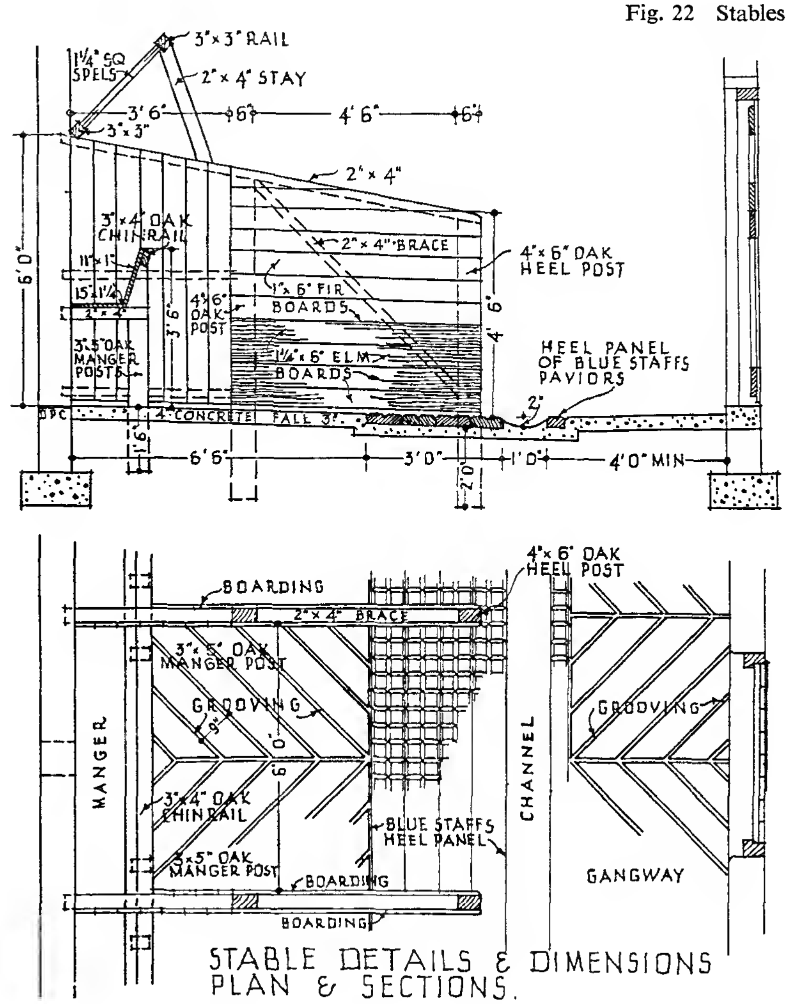



Fig. 23 Horse stall

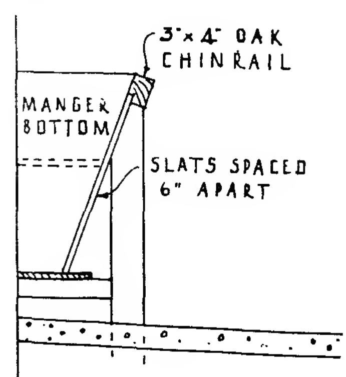



Fig. 24 Manger and hayrack

## Types of Crop

Farm crops may be roughly divided into those which are grown with the object of sale and those intended as fodder for livestock, though obviously the two classes shade into one another in such instances as hay or oats, and there is a third minor but important class—seeds.

## Field Crops

A fenced stackyard, preferably metalled to stand wheeled traffic, is an essential to any farm which retains a proportion of arable. Its area must be proportioned to the average expectation of crop. In years producing an abnormal grain crop, such as 1938, this may prove inadequate and call for overflow, but as storage is brief and temporary, no serious detriment arises. The old method by which grain crops were stacked on a base raised on the familiar stone mushroom-shaped staddles, and hand-thrashed in a capacious barn, has been ousted by the parallel method of stacking under permanent Dutch barns and thrashing mechanically, most often by a visiting engine and plant. Grain crops thus stay for much shorter times in stack, and in some cases are not stacked at all, but thrashed in the field by "combine harvesters." The Dutch barn has, however, the further object of sheltering the straw or hay crops, which are necessary to farm working either as bedding or fodder, and they have the advantage of giving immediate shelter, which may even include the last load each night without unloading, and saving the recurrent cost of thatching. Ugly as they are, they, therefore, form a desirable feature of farm equipment. Except for very minor examples, these are always the work of specialist firms, and made to a range of standard bay dimensions.

The materials employed are steel and galvanized iron (or corrugated asbestos-cement), or creosoted timber, the latter being advisable in districts adjacent to industrial areas, where galvanizing cannot be relied upon.

Points which should be remembered as affecting design and structure are:—

(1) Gales put a severe strain on the structure when the barns are empty, and the stanchions and bracing should be ample to withstand this.

(2) Some form of anchor for the stanchion feet in their concrete bases should be provided—either angle-iron cleats, bars threaded through the web, or other devices.

(3) The concrete bases should be brought up above ground level and weathered; often they are seen too low, forming pools around each stanchion.

(4) Any barn comprising more than one span in width must have a valley gutter of sufficient width for walking, and it must be well supported, otherwise blockage by dross and internal leakage is sometime inevitable.

(5) In exposed situations the wet aspects are preferably sheeted down either to ground level or to about 7ft. above it. The latter is sometimes an advantage, as it may permit a wagon to pass through after off-loading. The continental custom of gaining increased cover by a wide cantilevered roof spread beyond the line of stanchions does not seem to have caught on in this country (Fig. 25).

A range of Dutch barns in relation to other buildings is shown in Figs. 1 and 2. Isolated hay barns on similar lines are often necessary in outlying grass fields.

## Granaries

Granaries need to be dry and protected against rats. These requirements, as well as the desirability of storage in bulk in such position that delivery either to transport vehicles or for consumption may take place with the minimum effort, suggest an upper storey or loft. In the design of a granary it should be remembered that wall space for bins is of importance. The plan of a granary will, therefore, best comprise maximum wall space, centre gangway, top light over the gangway (never over the bins, in case of leakage), a loophole door with cathead and hoist adjacent to a hard road, a trap with easy ladder (6in. riser and angle not over 60° maximum), and probably a hopper and chute to the mixing room below, if this relationship exists (Fig. 26).

It is now becoming usual to provide silos for grain storage on larger farms. Such silos, usually constructed of concrete, often need to be closely associated with, or be within, a covered area in which grain-drying equipment may be installed.

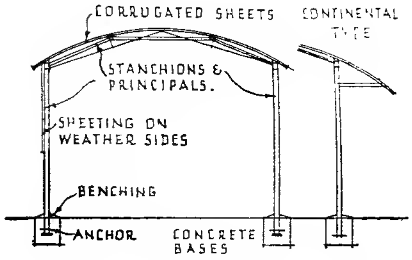



Fig. 25 Dutch barn

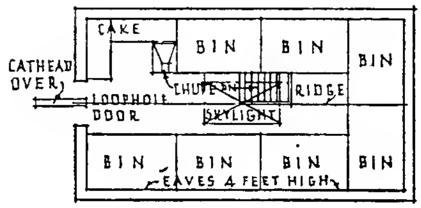



Fig. 26 Granary

## Cake-store

This is even more necessarily made proof against rats, and needs to have a stout floor. Grain in bins to a depth of 3ft. gives a loading of one and a half hundredweights per sq. ft., and oil-cake (which may be stacked higher) gives even heavier loading. A portion of the granary is usually set apart for storage of this important feeding stuff, which, of course, is not a crop but bought fodder, costly, and liable to exude oil, which would be detrimental to grain not intended for animal consumption.

## Chaffhouse

Chaff, being chiefly fed to horses, is preferably stored near the stabling—often a walled loose box adjoining the carthorse stable is fitted with a pitchhole door so that it may serve this double purpose. The requirements are:—

(1) Easy means of filling and withdrawing chaff.

(2) A sound roof and a dry floor.

(3) Stout walls or partitions capable of sustaining the pressure of a depth of 10ft. of chaff.

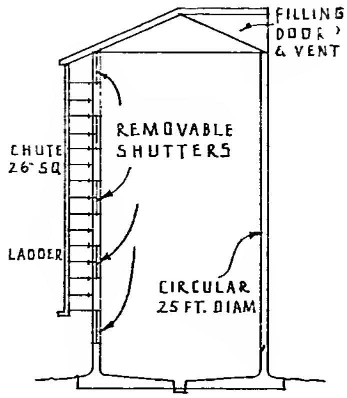



Fig. 27 Tower silo

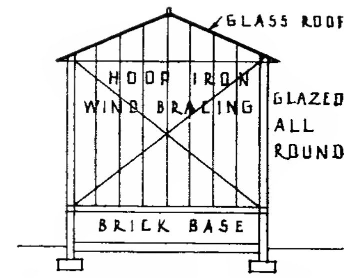



Fig. 28 Potato chitting house

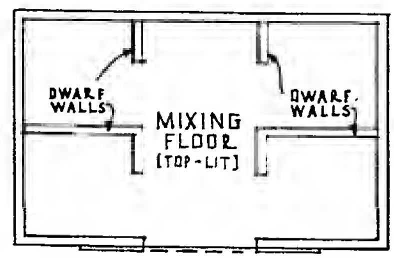



Fig. 29 Fertilizer stores

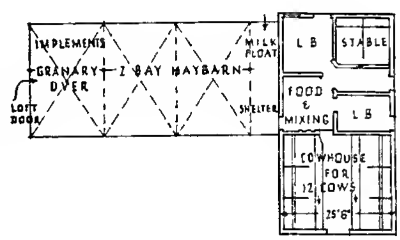



Fig. 30 Smallholding

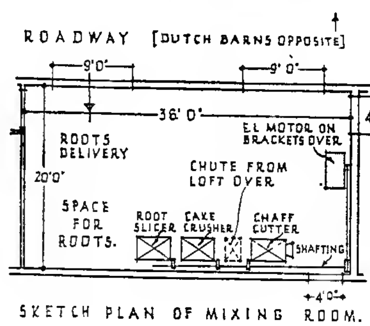



Fig. 31 Fodder room

Filling is usually by a pitch-hole door about 3ft. sq., as high as possible—say in a gable-end. Chaff is withdrawn for use by a slide or doorway at ground level. The need for dryness is due to the tendency of chaff which gets moist to swell and heat up, when it becomes spoilt.

### Roothouse

A roothouse intended to store immediate supplies of swedes or mangolds, stored in bulk by clamps in the field, should have large double doors off a hard road, to which a cart or lorry can back. It should perhaps be added that it is by means of oil-cake and roots for winter consumption that modern dairying and stock-raising has been rendered possible.

### Silage

Silage, which for the non-agricultural reader it may be necessary to explain is the name given to crops cut green and preserved for winter feed in an airtight container, requires special provision where its use is contemplated. A silo takes the form of a hollow round tower covered by a roof, with some provision for top ventilation. It is fitted with a large door at the top, through which it is filled (usually by a blower from the chaffing machine); there are also a number of smaller doors arranged one above the other up one side of this for its extraction when required for feeding. This vertical range of doors, each with a loose shutter, is generally contained in a projecting shaft on the silo structure, which also contains a vertical ladder for access. Provision for drainage of liquid from the silo bottom is requisite (Fig. 27).

A silo must be able to withstand considerable bursting pressure, and the favourite methods of construction are (1) creosoted wooden staves bound by metal hoops; (2) reinforced concrete; (3) interlocking concrete blocks.

As some guide to size, a silo to provide winter feed (in lieu of roots) for a herd of 25 cows might be 15ft. diameter by 30ft. high, and would contain roughly 100 tons of silage; a silo 12ft. diameter by 24ft. high, holding about 50 tons, would serve for a herd of 12 cows. The delivery chute from a silo should be in communication with the mixing-fodder place (*see* Fig.16).

### Seeds

Seeds, being relatively small in bulk, do not usually require special storage other than the granary, but an exception must be made for seed potatoes. In farming areas where this crop is a main industry a special form of glasshouse, known as a chitting house, is an essential. In this the seed potatoes are spread in trays piled in spaced tiers for the action of light to encourage shoots to form (Fig. 28).

A relatively new class of substance requiring provision for storage is the artificial manure or fertilizer now commonly employed. This must be a dry building and should have a specially hard and smooth concrete floor with sufficient free space for mixing. A wide central doorway should be provided capable of admitting a backed cart, and a few low brick open-fronted bins—say 3ft. high—are a convenience. A plan is given in Fig. 29.

### Fodder and its Preparation

One of the greatest drawbacks and labour-wasters in old farm buildings is the distance which it is often necessary to walk in order to collect the necessities for a ration. In planning or remodelling

the equipment it should be the aim to follow a scheme somewhat akin to up-to-date factory design, by which raw materials in bulk are conveyed and stored adjacent to their place of assembly, which itself should be centrally placed for ease of distribution.

Items which are compact and heavy should preferably be stored above their point of use; grain and cake, for instance, in a loft directly over the mixing floor (*see* Fig. 2), hay close at hand in Dutch barns or in some districts in lofts over stock-pens, roots in a part of the mixing-house, and silos (if provided) in close connection.

The scale of provision will, of course, depend on the acreage and type of farm. Fig. 2 gives an arrangement suitable in scale for an average farm of 100 acres or so; Fig. 30 shows the lesser provision suitable for a dairy holding up to 40 acres, while Fig. 16 gives the plan of an outfit which might serve for some 200 acres, with possibility of extension to either of the three ranges of stock housing.

TABLE OF APPROXIMATE DIMENSIONS OF TYPICAL FIELD IMPLEMENTS

| *Type* | *Length* | *Breadth* | *Height* |
|---|---|---|---|
| *Power* | ft. in. | ft. in. | ft. in. |
| Baler—large | 22 0 | 8 0 | 8 6 |
| Binder—large | 14 3 | 8 6 | 9 0 |
| Combine harvester | 23 0 | 13 6 | 10 10 |
| Disk harrow | 7 0 – 13 0 | 8 9 – 10 0 | 2 6 – 6 0 |
| Elevator | 12 6 | 7 0 | 7 0 |
| Float | 26 6 | 7 3 | 10 0 |
| Manure spreader | 15 0 | 6 0 | 4 9 |
| Manure distributor | 7 0 | 10 8 | 4 0 |
| Mower | 8 4 | 5 8 | 6 0 |
| Plough—single furrow | 4 8 – 8 0 | 3 6 – 4 3 | 3 6 – 5 6 |
| Plough—three furrow | 12 0 | 4 4 – 4 6 | 3 6 – 5 4 |
| Potato digger | 7 0 – 11 3 | 3 3 – 7 6 | 4 0 – 5 9 |
| Ditto with picker attached | 18 0 | 7 6 | 4 6 |
| Roller | 4 6 – 8 0 | 7 0 – 8 4 | 2 0 – 2 3 |
| Seed driller | 6 0 – 10 0 | 10 0 – 24 6 | 4 0 – 6 0 |
| Spraying machine | 10 0 | 16 0 | 9 0 |
| Sweep | 12 0 | 10 0 | 3 3 |
| Threshing machine | 13 0 – 22 3 | 6 0 – 8 0 | 9 6 – 11 0 |
| Tractor | 7 7 – 10 6 | 4 4 – 7 3 | 4 2 – 6 8 |
| Trailer | 14 0 – 16 6 | 6 6 – 7 6 | 3 4 – 6 0 |
| *Horse* | | | |
| Cart—2 wheels | 13 0 – 15 0 | 5 0 – 6 0 | 6 0 |
| Harrow | 6 0 | 18 0 (in use) | 2 0 |
| Plough | 11 0 | 2 4 | 2 9 |
| Potato digger | 14 6 | 5 6 | 4 9 |
| Reaper | 15 0 | 10 0 | 5 6 |
| Roller | 12 0 – 14 6 | 6 9 – 10 6 | 3 0 – 3 9 |
| Waggon—4 wheels | 18 0 | 6 3 | 5 0 |
| *Hand* | | | |
| Barrow | 5 9 | 2 8 | 2 0 |

### The Mixing Floor

The mixing floor will usually have to accommodate a certain amount of machinery, the layout of which is important. The motive-power will usually be an electric motor or diesel oil-engine, which most commonly must be so placed that it may fulfil several other objects—for example, pumping, driving an external sawbench by means of a spare pulley, and (if no public supply exists) generating lighting current. Dairy equipment may also be actuated. The strictly fodder-treating apparatus likely to be installed may consist of a kibbler or cake-crusher, root-slicer and chaff-cutter (Fig. 31). Where dairying is carried out on an extensive scale, live steam is a necessity for sterilizing, and in these circumstances it may be more practical to utilize steam-power for mechanical purposes as well. The steam-boiler, with provision for fuel, should be accommodated in a separate compartment as every type of dust (such as may arise from hay and chaff) is liable to produce an inflammable mixture. Fodder distribution on a large scale is much facilitated by the provision of slung tracks carrying special trolleys, which may also be extended so as to convey litter and dung. These require early consideration in planning; dotted lines in Fig. 16 show such an installation, which, however, is somewhat expensive in first cost and only justifiable when by its inclusion it permits a definite reduction in employed men. Below that stage, the less costly provision of " loose-wheel " trolleys might more often be made—these require no structural provision other than an avoidance of steps higher than a few inches.

### Shelter for Implements

The old style cart shed and implement shelter was almost invariably sited to face north. This had a dual object; a sunny aspect is liable to occasion shrinkage of wooden wheels and wagon structures so that these tend to fall apart; also sunny aspects are valuable for livestock shelters. The north aspect is still the most suitable for wagons and carts, and shelters intended for these should have a minimum depth of 14ft. and a minimum opening between posts or pillars of 9ft. In both cases greater depth up to 20ft. (which would cover a wagon with its shafts) and a width of opening up to the maximum possible is to be preferred. An unobstructed entry permits more economical use than any system of " bays," allowing such unwieldy objects as drills and reapers to be housed, and also permitting closer packing among the lesser implements. It must be realized that many essential farm implements have strictly seasonal use, so that their relegation to the rear of a deep shelter is not so inconvenient as may appear.

Where circumstances favour, a " pull-through " type of shed is a great convenience, but is apt to increase the necessary amount of hard road surface requisite for satisfactory working.

A farm workshop in which periodic servicing and minor repairs to implements and mechanical equipment can be performed, becomes almost a modern necessity. This should contain a bench with vice, bins and racks, and possibly a forge and anvil.

BUILDINGS FOR IMPLEMENTS, SUNDRY SPECIAL UNITS

### Tractor House

A garage for one or more farm tractors is a modern requisite on most arable farms, and storage of motor fuel is also needed. It is unwise to combine either of these with other farm buildings; they should stand detached.

The accompanying table sets out approximate overall dimensions of farm implements which have not only to be housed but also need space for movement, especially turning. Ample access space should be allowed when designing implement stores so that each implement is accessible for repairs and maintenance during cold or wet weather without moving other implements. It should be noted that large doorways are of the utmost importance both in regard to height and width.

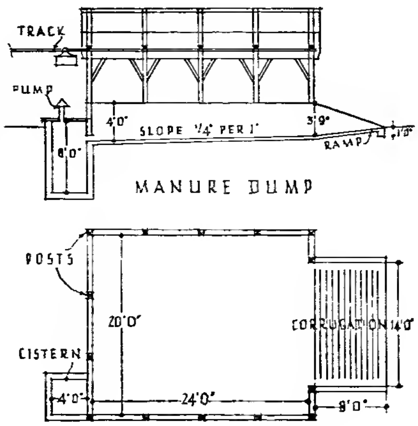



Fig. 32 Dungstead

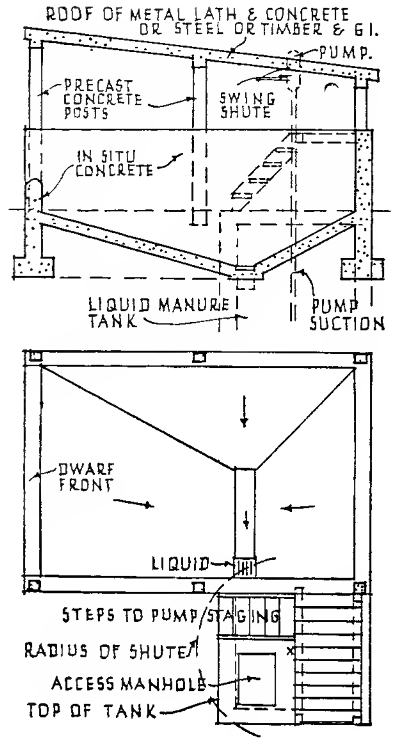


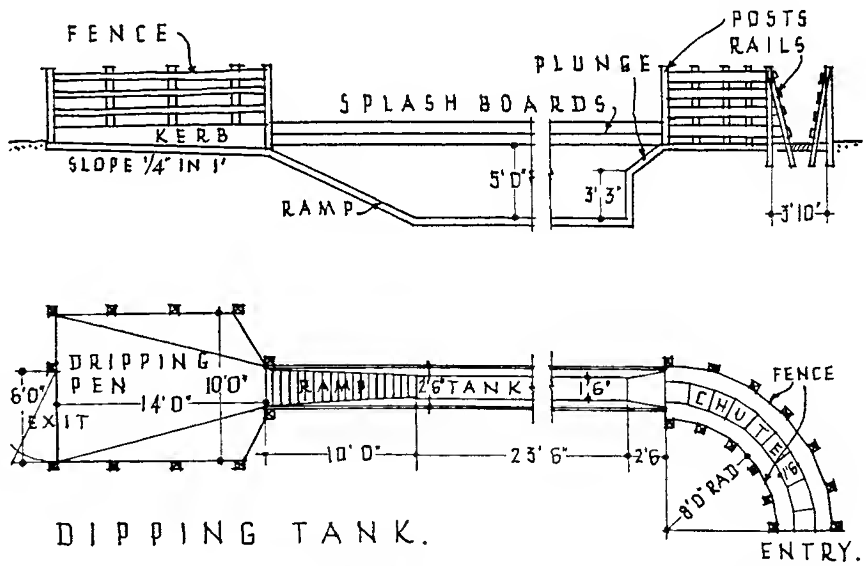

Fig. 33 Dungstead

### Manure Pit or Dungstead

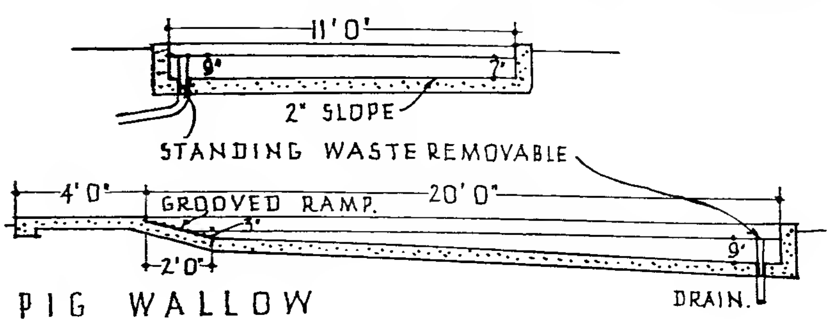
The untidy and wasteful manure heap should form no part of the modern farmstead. The fertilizing value of manure requires conservation, which in the case of solids is best attained by a covered and water-retaining pit, while liquids should not be allowed to run to waste, but conserved either by incorporation with litter in yards as already described, or by collection by drains in a conveniently placed underground tank. The fertilizing value of manure is said to be reduced by about one-third if it is left exposed to the weather. A convenient method of preservation is shown in Fig. 33, suitable for a small farm. Points which must be considered are means of loading, ease of removal, and treatment during storage period. On the larger scale proper to a big farm, these can be solved by the methods shown in Fig. 32.

Delivery is by carriers on a runway from the animal houses, or sometimes by a barrowing ramp. Removal is by the cart-ramp shown, and by way of treatment during maturing period, the liquid manure tank which receives farm drainage is so placed that by pumping the liquid and distributing it over the surface of the stored dung and litter from time to time, the proper degree of rottenness is attained.

The liquid which drains from the manure in the pit also escapes to the tank adjoining.




Above: Fig. 34 Sheep dip Below: Fig. 35 Pig wallow



### Sheep- or Pig-dip

Vermin and diseases in lesser farm animals are countered by dipping in chemical solutions at certain seasons, an operation which requires a properly designed and constructed dipping tank. In the design of the tank shown in Fig. 34 the following vital points should be noted. The entrance passage should be inclined, and the object of the turn is that the animal should not see where it is going. Next the tank is a steeper slope which will shoot the animal in, but not so sharply as to cause risk of injury. The tank must be narrow, to prevent the animal turning round, long enough to secure immersion for a minute or two, and deep enough to make it disappear on the first plunge, and to compel swimming. At the far end should be an easy slope roughened or cleated to give good foothold.

The dipping-pen shown is important to prevent loss of the dipping solution, which would be costly. The liquid drains back to the tank, and is not wasted.

In connection with any dipping tank, arrangements of collecting pens at entry and exit are usually made by means of hurdles.

### Pig Wallows

A less usual item of farm equipment is the pig wallow, but its provision in connection with pigkeeping on any considerable scale would usually be an economy. Pigs will wallow in mud if no better facility for keeping cool is afforded them; the fresh water wallow allows them to be clean and comfortable; it can be used on occasion for disinfection from vermin; and it should be recognized that the comfortable pig " does " better in consequence. A wallow of the size shown in Fig. 35 would serve 20 to 30 pigs. If a continuous flow of water from a spring can be arranged it is best. Drainage is by a standing waste and overflow.

### Staff Facilities

On larger farms some provision should be made for staff; this should comprise cycle storage, sanitary accommodation and a mess room with facilities for clothing to be hung up. A drying room is also advantageous. Wash-basins are needed in dairies. It is convenient to plan the staff room near the dairy boiler house and near to the isolation boxes where duties may need long hours of attendance. Staff rooms do not need to be elaborate.

### Fire Risks

There are considerable fire risks associated with farms due to the inflammability of materials such as straw. Special care in the storage of petrol and paraffin is of the utmost importance. Carefully planned fire-breaks should be introduced where possible. Adequate water storage for fire fighting should be provided.

### Water

An adequate water supply is of the utmost importance, where milk cows are kept at least 30 gallons per head per day are required and other cattle and horses require 10 gallons per head per day.

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